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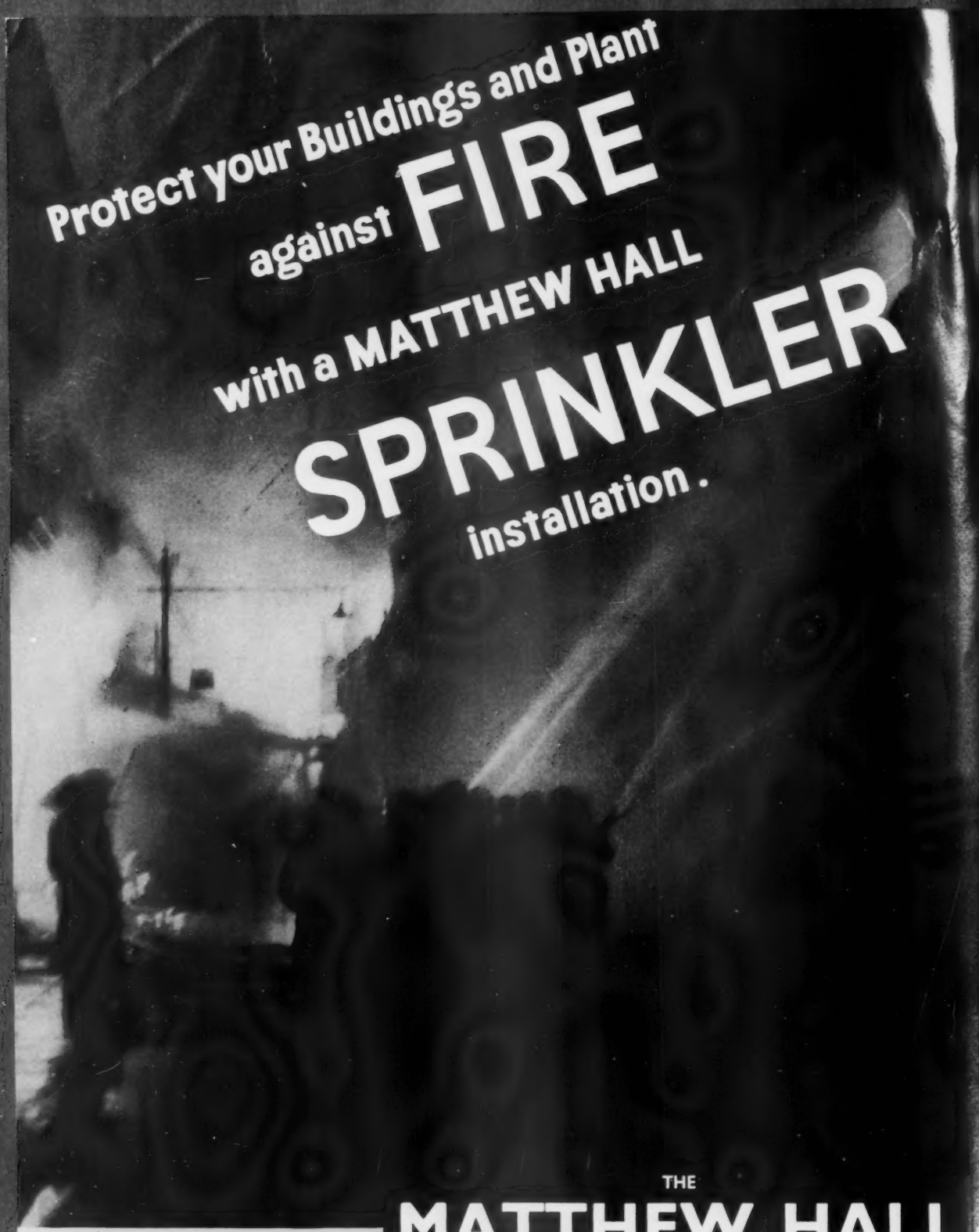

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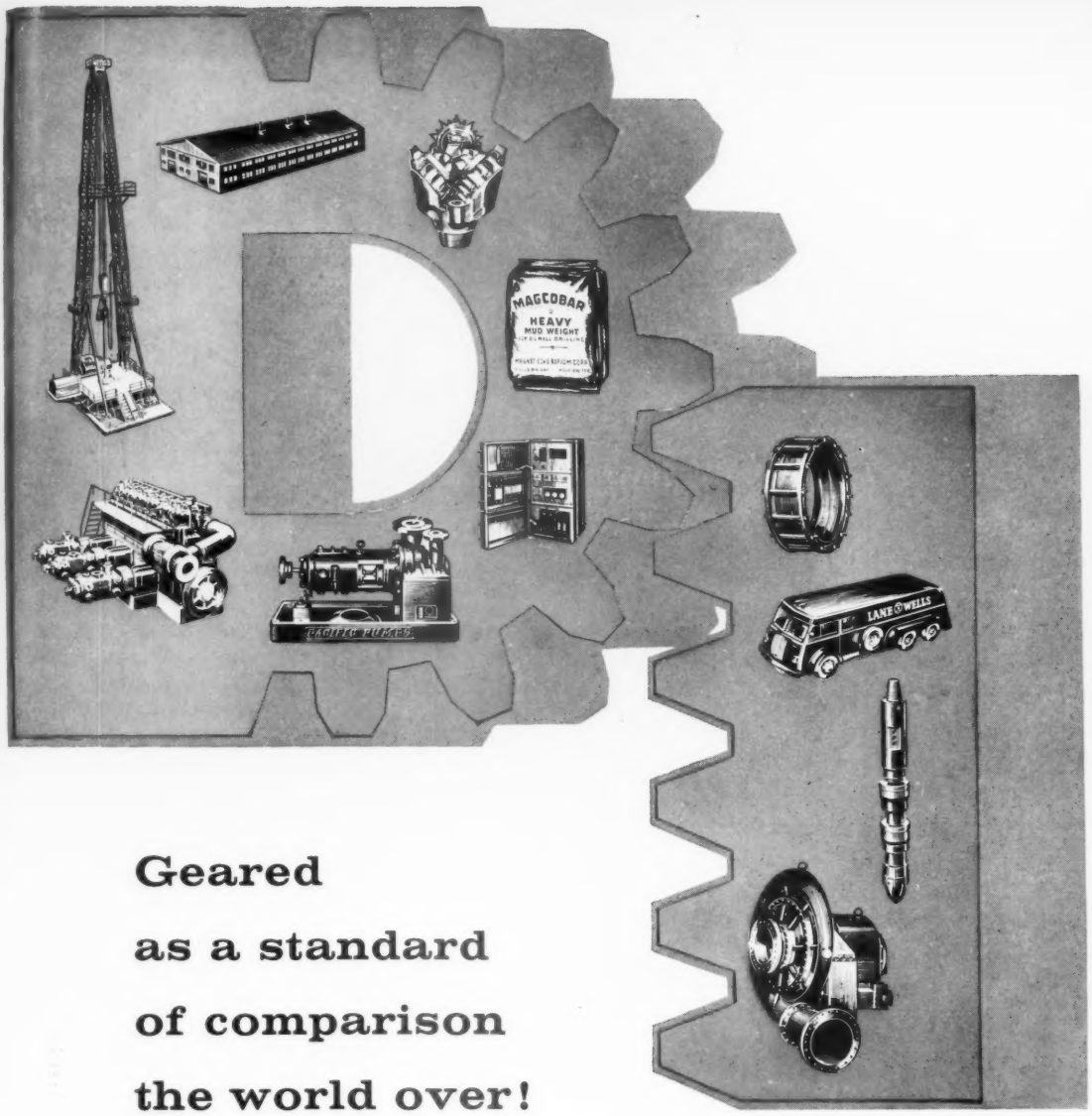

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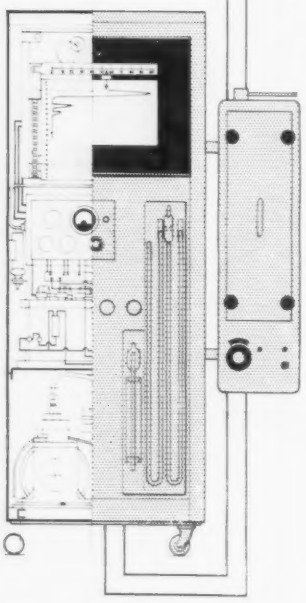

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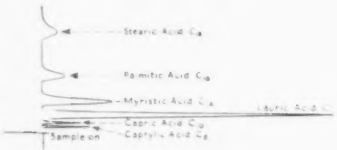

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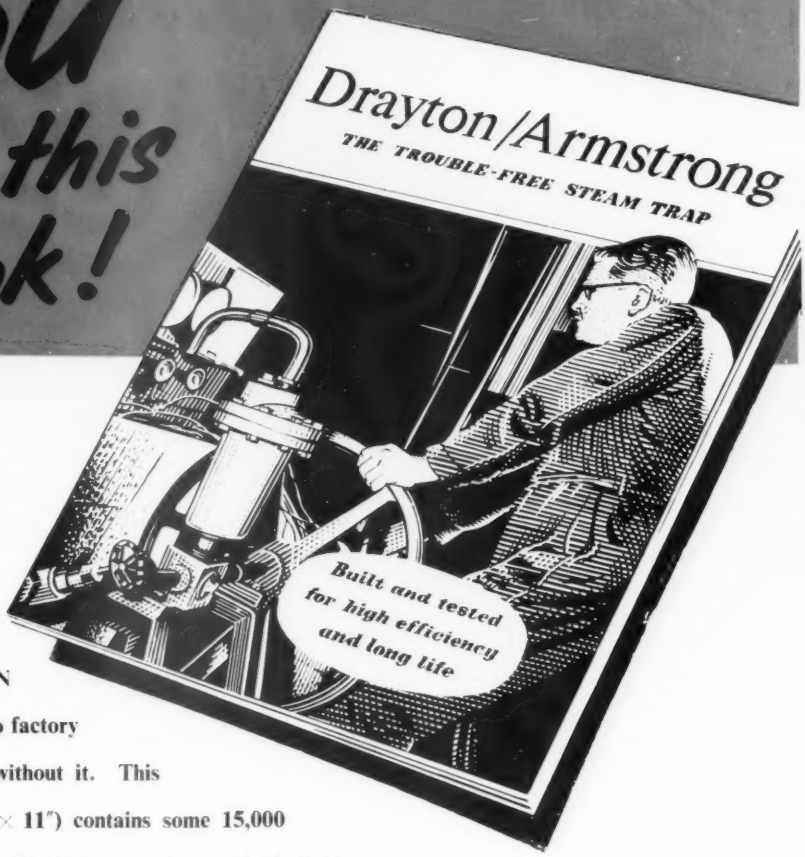

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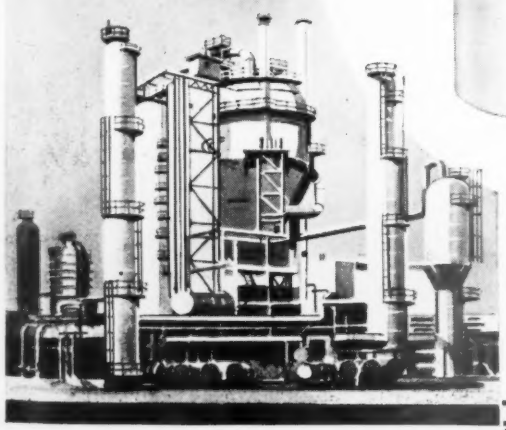

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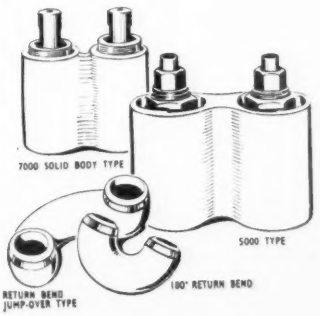

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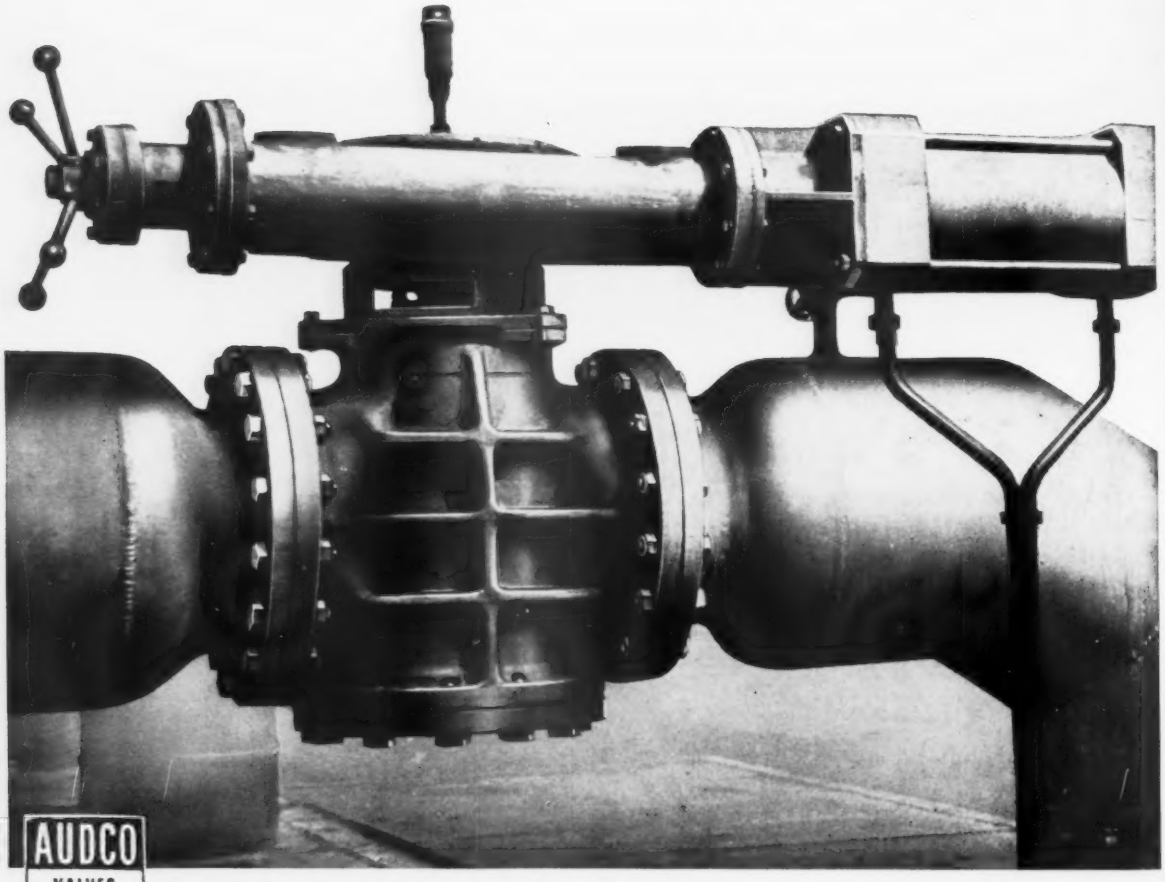

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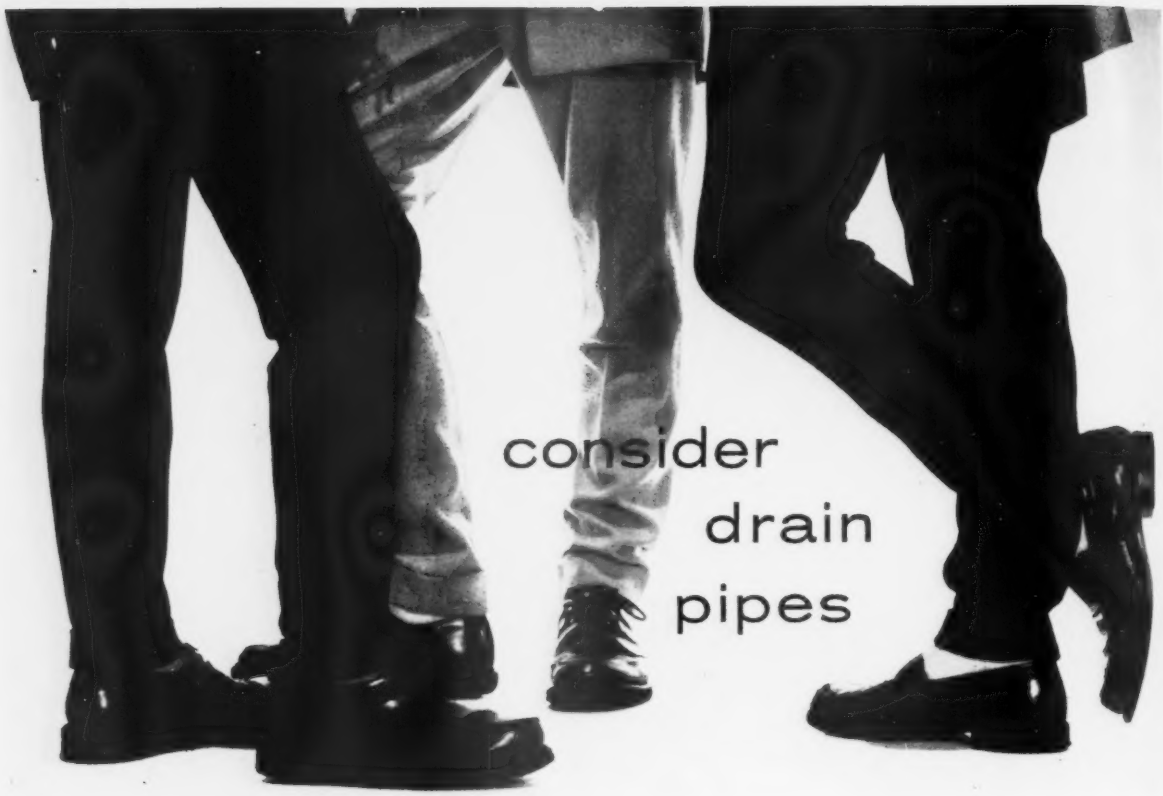

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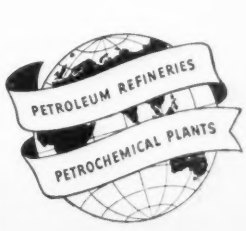

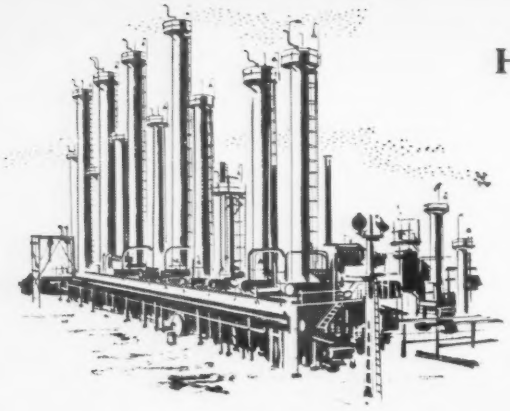

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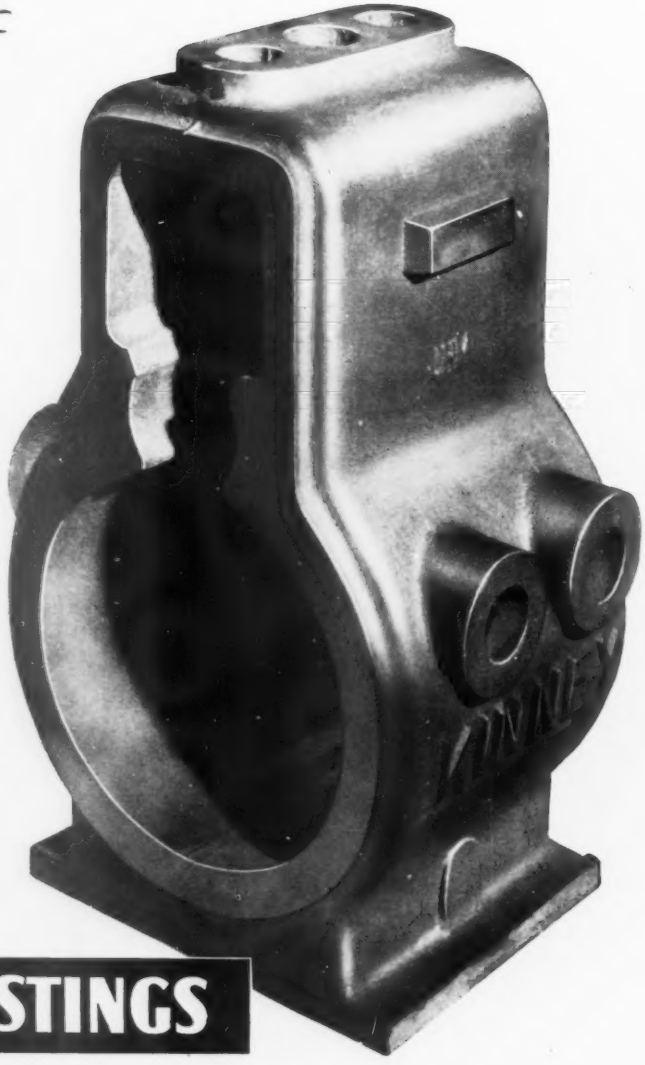

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*Energy Studies**

By R. REGUL†

The term "Energy Studies" covers a wide field but this paper is concerned only with the reasons why such studies are carried out by the European Coal and Steel Community (ECSC) and the form that these studies take.

It is necessary for the six countries which comprise ECSC, Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands to have a co-ordinated energy policy. Energy requirements in these countries are increasing much faster than indigenous energy production and as a result these countries' external balance of energy supplies shows a deficit which is not easy to meet. This in turn raises serious problems on the dependability of energy supplies. However certain encouraging prospects are being opened up by the intensified working of existing resources and the discovery of new resources. All this involves heavy capital investment which takes a very long time to produce the desired results. If each of the six countries were to embark independently on such investment, this would probably only inflate investment costs and make the schemes more difficult to finance. Decisions would have to be taken on the apportionment of capital to be devoted to crude energy, to improvement of energy utilization, or to a combination of both.

Two-thirds of the energy requirements of the six countries are met from coal, which falls under the common market. Experience has shown that it is not possible to carry on a coal policy all on its own—*i.e.*, without relating it to the other types of energy. As time goes on, this will be even more obvious as atomic energy comes to play an increasing part in meeting energy requirements.

Any energy policy is based ultimately on a choice of alternatives, the "either . . . or" and more particularly the choice between priority being given to security of supplies or low prices. Other major points are whether it is more important to consider present or future demand, what is done to meet peak requirements, and what constitutes fair competition between the various forms of energy supplies. Energy policy, in general, is concerned with selection, directions for action, and instructions to execute the policy.

* Read at a meeting of the IP Economics and Operations Group on 9 January 1958.

† European Coal and Steel Community.

The major points outlined above were the considerationr that induced the six Governments to agree to line up theis energy policies. This lining-up process does not mean that the rules of the Common Market for coal and steel are to be applied to other forms of energy. Nor does it mean that all the countries are expected to act alike. What it does mean is that the individual situation of each country is properly taken into account, and complementary ways and means are employed to produce the maximum overall effect.

Three special aspects of energy studies are considered below. They are:

(1) The methods used by ECSC in working out energy balance-sheets.

(2) Certain technical and economic factors affecting competition between energy sources.

(3) Long-term forecasts of energy requirements.

Methods used in Drawing up Energy Balance-sheets

In order to draw up comparable energy balance-sheets for the six countries, it was necessary to decide, first, what yardstick to adopt, and secondly, what stage or stages to cover, *i.e.*, supply only or supply, conversion, consumption, and utilization.

The ECSC opted for the kilocalorie as the unit of calculation, and for a balance-sheet including all stages from supply to utilization.

The principle of this method is to differentiate between crude and effective energy, to follow the conversion of energy from stage to stage, and to make allowance for the losses incurred at each conversion.

The Community's energy balance-sheet is given in some detail in Tables I to IV. Table I shows that the total supply of energy in 1955 amounted to 3028 Tkcal (Tkcal $= 10^{12}$kcal) and the average efficiency in conversion from primary to secondary energy (Table II) was 78·7 per cent. The average energy utilization efficiency was 47·4 per cent. This gives an overall efficiency of 37·8 per cent.

The usefulness of these "energy flow-sheets" depends on the calorific values of the different forms of energy being accurately known, and on how far it has been possible to

calculate the efficiency rates, particularly for utilization. For such balance-sheets only the net calorific value can be used, *i.e.*, the calorific value of a fuel exclusive of the latent heat of steam produced from the moisture content in the fuel and of burning the hydrogen content. The calorific values in Table V are weighted averages for each country. The averages for the Community were worked out in the same way. The figures still contain certain errors which have not so far been satisfactorily eliminated.

TABLE I

OVERALL ENERGY SUPPLY OF THE COMMUNITY IN 1955

Resources	*Tkcal* ($=10^{12}$ *Kcal*)
Primary Energy	
Production	2,089·6
Withdrawals from producers' stocks	38·1
Imports	815·2
Subtotal	2,942·9
of which:	
Hard coal	1,892·6
Brown coal	205·5
Oil	706·1
Natural gas and methane	38·7
Peat	4·2
Water-power	84·3
Terrestrial heat	11·5
Secondary energy	
Withdrawals from producers' stocks	17·5
Imports	68·4
Subtotal	85·9
Total	3,028·8

(This corresponds to 432·7 million tons hard coal equivalent.)

The calorific value of 1 kWh is 860 kcal. In dealing with hydro-energy, the method used is to compute the average efficiency for conversion into hydro-electric power. On the basis of the position in Italy, ECSC took this as 70 per cent. Thus the calorific value of water power is $\frac{860}{0{\cdot}70 \text{ kcal}} = 1230$ kcal/kWh. This figure, too, contains a certain element of error.

The focal point of all energy surveys is the calculation of the conversion and utilization efficiency rates. In point of fact, the trend in the energy economy over not only the past few years, but also the next twenty or more has been, and will continue to be, governed by two quite different considerations—the increasing part taken by secondary energy in covering requirements, and the increasing interchangeability of the different types of energy.

TABLE II

APPARENT CONSUMPTION OF ENERGY OF THE COMMUNITY IN 1955

Resources	*Tkcal* ($=10^{12}$ *Kcal*)
Primary energy	
Own consumption and stock variations	74·1
Exports	90·2
Home supply	674·3
Subtotal	838·6
Input of primary and secondary energy	2,310·0
Production of secondary energy	1,817·2
Conversion efficiency in per cent	78·7
Secondary energy	
Own consumption and stock variations	227·3
Exports	195·6
Home supply	1,441·1
Subtotal	1,864·0
Consumption in conversion and losses	326·2
Total energy consumption	3,028·8

TABLE III

END CONSUMPTION OF ENERGY OF THE COMMUNITY IN 1955

Type/form of energy	*Tkcal*	*In per cent of total*
Chemical energy	301·7	14·6
Mechanical energy	428·9	20·8
Thermal energy	1,336·5	64·6
Total consumption*	2,067·1	100·0
of which:		
Hard coal	612·7	29·6
Coke	458·4	22·2
Other solid fuels	239·9	11·6
Liquid fuels	418·8	20·3
Gas	208·9	10·1
Electricity	128·4	6·2

* The difference between this figure and that of 2,118·4 (in Table II) is due to the incomplete statistics available for trade between the Community countries.

The energy balance-sheets (Tables I–IV) of the six countries demonstrate clearly how sharp the rise has been in the proportion of secondary energy supplied to the home markets: in 1920 it was about 30 per cent, in 1950 about 58 per cent, and in 1955 something like 68 per cent. The principal economic significance of this development is that it has become very much easier to employ the different types of energy interchangeably. This process is bound to affect considerably all forecasts of future trends in requirements and the future competitive position.

At the same time, there are limits to the preponderance of secondary energy and the substitution of one form of energy for another. These are due partly to certain technical considerations—*e.g.*, whether demand in a particular connexion is "specific", *i.e.*, whether it can be met only from *one* particular type of energy, or whether the consumer has a choice of alternative fuels. There are two other significant factors. One is the question of the comparative expenditure of crude energy involved, from the point of view of a particular economic sector. The other is the cost to the consumer. The first point is an element in energy policy; the second is a criterion to be borne in mind in considering whether the different forms of energy are economically competitive from the consumer's point of view.

TABLE IV

EFFECTIVE ENERGY IN 1955

Type/form of energy	*Tkcal*	*In per cent of total*
Chemical energy	150·8	15·4
Mechanical energy	111·2	11·3
Thermal energy	718·2	73·3
Total*	980·2	100·0
of which:		
Hard coal	233·9	23·9
Coke	225·8	23·0
Other solid fuels	111·9	11·4
Liquid fuels	167·3	17·1
Gas	137·9	14·1
Electricity	103·4	10·5

* The utilization efficiency of home consumption as a whole is $\frac{980{\cdot}2}{2067{\cdot}1} = 47{\cdot}4$ per cent

TABLE V

CALORIFIC VALUES

Primary energy	
Hard coal, regular grades	7,000 kcal/kg
Hard coal, low grade	4,300 kcal/kg
Brown coal, recent	2,000 kcal/kg
Brown coal, older	5,200 kcal/kg
Brown coal, imported into Germany	3,500 kcal/kg
Oil	10,000 kcal/kg
Natural gas	8,300–9,000 kcal/cu. m.
Methane	3,800–4,400 kcal/cu. m.
Peat	3,000 kcal/kg
Secondary energy	
Coke	6,700 kcal/kg
Hard-coal briquettes	7,200 kcal/kg
Brown-coal briquettes	4,800 kcal/kg
Low-temperature hard-coal coke	6,850 kcal/kg
Low-temperature brown-coal coke	4,800 kcal/kg
Petrol/benzene	10,400 kcal/kg
Gas/diesel oil	10,100 kcal/kg
Fuel oil	9,800 kcal/kg
Illuminating oil	10,100 kcal/kg
Pitch for briquetting	8,300 kcal/kg
Liquid gas	11,500 kcal/cu. m.
Blast-furnace gas	1,000 kcal/cu. m.
Other gases	3,700–4,300 kcal/cu. m.

ECSC surveys have given reasonably accurate figures for the efficiency rates as regards conversion from primary into secondary energy. Table VI shows that the 1955 efficiency rates were:

	per cent
Coking-plants	82·9
Gasworks	75·0
Thermal power-stations	23·3
Oil refineries	92·0

All the figures are net efficiency rates, *i.e.*, minus own consumption and losses, but the figures for coking-plants and refineries relate to total production, *i.e.*, including secondary products not used as energy, such as ammonia and paraffin.

If these overall figures are compared, particularly country by country, certain indications are gained as to what can still be achieved in the way of improvements to the thermal economy. Power stations offer the biggest opportunities. The lowest efficiency rates in the Community countries average 18 per cent and the highest 28 per cent, while the latest stations are recording rates of up to 33 per cent. Naturally, coal or oil-fired power stations cannot be expected to keep up such high efficiency rates throughout their life-times, but it is reasonable to suppose that over the next twenty years specific fuel consumption per kilowatt-hour will be reduced by 100 grammes per kWh—*i.e.*, from approximately 520 gr to approximately 420 gr hard-coal equivalent per kilowatt-hour.

As regards the efficiency rates in the coking-plants and oil refineries, there are no big prospects of further improvements, except in gas works.

On efficiency rates for energy utilization there is less data. The ECSC considered whether to work out the ratio of output to input, taking input as the consumption of coal, or fuel oil, or electricity, and output as the yield in heat, or mechanical energy (power), or chemical energy, or light. This is a very complicated business, and it is impossible to know in advance whether the results will justify the amount of work involved. Again, it would be necessary to know the efficiency rates of the different forms of energy more accurately than present knowledge permits. However, in comparing coal and fuel oil, the prospects of achieving any useful result are often practically nil.

In view of all these uncertain factors, if all idea of tabulating effective energy as used is not to be abandoned it is necessary to fall back on typical values which can reasonably be assumed provisionally to be approximately accurate. Table VII shows the efficiency rates that ECSC is using for the time being, based on surveys carried out among large consumer groups.

The main application of chemical energy is the reduction of ores in the blast-furnace. In the future ECSC may have to devote greater attention to electrolysis, but at present this method is not quantitatively very important. The efficiency in the blast-furnace is known fairly accurately: it works out at 50 per cent, if blast-furnace gas is disregarded. Blast-furnace efficiency is not likely to be increased in the future. Germany is a case in point. From 1950 to 1957, German coke consumption per ton of pig-iron has gone down by 1·4 per cent each year; at the same time fuel consumption in the other branches of the iron and steel industry—*i.e.*, in the steelworks and in the rolling-mills—has gone down by 10·4 per cent each year. Of course, the Community may manage later on to reduce specific fuel consumption per ton of pig-iron considerably by making changes in the composition of the burden or by introducing new iron-making processes, *e.g.*, low-shaft furnaces or direct reduction of iron ore or finally utilization of nuclear energy for heat raising.

There is quite a lot of information on driving-power. In the tables the averages given allow for a number of advantages and disadvantages attaching to the various types of

TABLE VI

EFFICIENCY RATES OF ENERGY CONVERSION

Cokeries

Country	*Input of primary energy*	*Extra energy required*	*Output*	*Own consumption and losses*	*Efficiency*
		Tkcal			*per cent*
	A	*B*	*C*	*D*	$(C-D):(A+B)$
Belgium	59·83	1·40	56·41	5·27	83·5
France	91·21	1·82	87·23	10·23	82·8
Germany (West)	327·18	8·59	309·45	33·70	82·1
Italy	25·37	0·32	23·14	1·35	84·8
Netherlands	31·26	1·46	30·75	2·78	86·2
Saar	35·60	1·24	33·90	2·11	86·3
Community	570·45	18·83	540·88	55·45	82·9

Thermal power stations

Country	*Fuel consumption Tkcal*	*Net output of electricity*	*Fuel consumption*	*Efficiency per cent*
	A	10^6 *kWh* *B*	*Kcal/kWh* $C=A:B$	$D=\frac{860}{C}$ *per cent*
Belgium	38·93	10,820	3·598	23·9
France	99·17	24,088	4·117	20·9
Germany (West)	218·40	60,442	3·613	23·8
Italy	16·18	5,185	3·120	27·6
Luxembourg	4·36	1,100	3·968	21·7
Netherlands	35·54	10,584	3·358	25·6
Saar	10·17	2,147	4·738	18·2
Community	422·75	114,366	3·696	23·3

Oil refineries

Overall efficiency = 92 per cent

energy. The figure of 25 per cent given as the efficiency of diesel locomotives in Table VII, for instance, takes into account the fact that this type of engine dispenses with the waiting periods and stoppages which occur with steam engines. Again, the figure of 85 per cent for electric traction applies only to the electric engine itself. As the average efficiency of the thermal power stations is 23 per cent, we get an overall efficiency of 18–20 per cent. Where the electric current comes from hydro-electric power stations, the efficiency can be very high indeed, but at the same time we have to remember that transmission losses of electric current over long distances are very considerable, and that not all areas are adequately supplied with hydro-power.

There is very little information on efficiency in heat generation. The efficiency rates depend on various factors—in industry on the production processes, the nature and condition of the heat-producing plant, the proportion which each branch of industry represents in the total consumption of each form of energy, and so on; in the household sector on whether open fires or closed stoves are used, whether heat is produced simultaneously for cooking and space-heating purposes, what type of heat insulation is used in the houses, and so on.

If the input and output of energy are broken down by types, the following percentages are obtained for the year 1955:—

	Input	*Output*
Solid fuels	63·4	58·3
Of which coal represents ...	29·6	23·9
Liquid fuels	20·3	17·1
Gas	10·1	14·1
Electricity	6·2	10·5

The above list shows the real proportion represented in the total by the so-called valorized forms of energy, *i.e.*, gas and electricity.

Rough and unreliable though many of the efficiency rates are, some general economic conclusions may be drawn from them. Table VIII and, in particular, its individual efficiency rates which have been assumed, must be regarded as a first approach to the problem.

However, even leaving on one side the cost of the different types of energy, and the various advantages which cannot be expressed in figures, the following conclusions may be drawn.

First, as regards space-heating, and particularly central heating, there is very little to choose between the efficiency rates of coal, fuel oil, and gas: it depends on the individual supply situation, and of course on the costs involved, which is the best from the consumer's point of view. Where all electric energy is generated from hydro-power, it can also be used for heating purposes. The superiority of hydro-power as regards the cost of supply is, however, very much diminished, and indeed sometimes reversed, where a part of electrical energy has to be produced by thermal plants at the same time. Unfortunately, this is the case in practically all continental countries.

Gas has very definite advantages, particularly for cooking.

The advantages of diesel oil in the production of mechanical energy are also obvious. It is however, not possible without very detailed study to say whether this is so as regards steam-raising and other industrial heating processes.

TABLE VII

EFFICIENCY RATES OF ENERGY UTILIZATION

	Per cent
Efficiency, chemical energy	
Coke in the blast-furnaces	50
Coke in the metallurgical and chemical industries ...	50
Efficiency, mechanical energy	
Railways:	
Coal in locomotives	5
Fuel oil in locomotive fireboxes	7
Diesel oil	25
Electricity	85
(Efficiency of diesel locomotive is calculated on basis of theoretical efficiency of diesel engine).	
Shipping:	
Coal	5
Fuel oil in ships' boiler furnaces...	7
Diesel oil	25
Air transport: Gasoline	22
Road transport:	
Gasoline	20
Diesel oil	25
Industry: Electricity	80
Efficiency, thermal energy	
Electricity in electric furnace (taking efficiency recorded for electric boilers)	90
Other industrial uses	
(Average efficiencies shown vary according to production process, condition and type of thermal plant, relative incidence of different branches of industry in total consumption of each form of energy, etc., all of which in their turn vary from one country to another. Efficiency of boilers, for example, may be anything from 60 to 92 per cent and that of industrial furnaces from 10 to 40 per cent.)	
	Per cent
Solid fuels	45
Liquid fuels	59
Gas	65
Electricity	80
(Efficiency of liquid fuels is calculated on basis of estimated efficiency of solid fuels, as equal to 1·3 times the latter).	
Household sector	
(Comparatively high efficiency for solid fuels is due to frequent use of modern heating apparatus. Efficiency of liquid fuels is again calculated at 1·3 times that of solid fuels).	
	Per cent
Solid fuels	50
Liquid fuels	65
Gas	75
Electricity	80

Competition among the Different Forms of Energy

The object of studying this problem is to provide better means of forecasting future trends than ECSC possesses at present. For the time being data is being extracted by extrapolating the figures of past years. But in trying to give some idea of the changes which are likely to come about in the proportions of the various forms of energy to one another, it is necessary to consider various elasticities of demand.

The consumer will give preference to whichever form of energy is cheapest for him. This depends as a rule on a number of considerations—calorific value, efficiency, and such additional factors as ease of handling, adaptability to fluctuations in heat requirements, reduction of operating costs, and so on. Most of these factors are constant: they depend on a particular technical method and are well known. Table IX gives some figures gathered from various sources. This being so, the price factor is the most important element of flexibility. It must, however, be borne in mind that changing from one form of energy to another involves

investment costs. This is one of the main reasons why substitution of one type of energy for another generally involves a delay.

In the first study carried out by ECSC, on elasticity of substitution between coal and fuel oil, it was confirmed that the efficiency rates vary very little. For the sake of simplicity, therefore, the price per million kilocalories was taken as the reference quantity.

Short-term elasticity of substitution—*i.e.*, immediate consumer reaction to a change in the price ratios—is so slight that for practical purposes it may be ignored.

Long-term elasticity of substitution is much greater, because industrial consumers generally take some time to decide on substitution. Conversion of industrial firing installations has a good deal to do with this. It has been found that quantitative changes as a result of price shifts occur only after three years.

A study in this connexion has been made for one of the six Community countries, and a second for another country is in preparation. The long-term elasticity coefficients for the first study worked out as follows: 1949, −0·5; 1950, −0·5; 1951, −0·8; 1952, −2·0; 1953, −1·7; 1954, −2·4; 1955, −4·3; 1956, −11·1.

The average for 1949–56 is −3·0. That is to say, a drop in the ratio of fuel-oil prices to coal prices of 1 per cent produces a 3 per cent movement in the tonnage ratio three years later. Therefore, if coal and fuel-oil supplies are taken together as a single whole, the share of coal goes down 3 per cent if the price of coal goes up 1 per cent in relation to the price of fuel-oil. (This refers only to industrial consumption.) Elasticity of substitution increased very markedly during the period 1949–56, which is not surprising because the coal/fuel-oil price ratio developed very much in favour of oil.

In the country for which the first study was made, the price of fuel oil and gas oil went up by 37 per cent between 1949 and 1956, but the price of coal went up nearly 60 per cent. Moreover, in many of the big consumer centres in the six countries the price of coal is now above that of fuel oil (basing both on the effective calorific value). Consequently coal is likely to be replaced even more by fuel oil over the next few years. In the country for which the study was carried out, in 1949 industrial consumption of fuel oil was only 25 per cent of industrial consumption of coal: by 1956 it had risen to 75 per cent. If the disparity in the price trend continues, the elasticity of substitution will go on increasing until the majority of industrial consumers have opted for fuel oil. After that it will probably fall away again. Some consumers will never go over to fuel oil, for technical reasons. Others will probably install dual firing, which will mean an increase in short-term elasticity.

If this is to be more or less the way matters are going to work out in the future, a careful study of the conditions of competition in the Western European energy economy will be needed. It could be based roughly on the following assumptions.

(1) The increase in demand means that all the primary sources of energy must be properly exploited. The amount which each type of energy will contribute depends on the price at which it is able to enter into competition with the others.

(2) Coal is at a disadvantage competitively, owing to its lack of flexibility as a source of supply and because of the high incidence of labour costs, particularly of social charges. As capital expenditure in the coal-mining industry is, too, extremely

TABLE VIII

CRUDE-ENERGY REQUIREMENTS FOR VARIOUS CONVERSION PROCESSES

Employment	*Conversion*	*Estimated efficiency in per cent*				*Crude energy per 1000 kcal effective energy*
		Conversion into intermediate form of energy	*Transmission*	*Conversion into effective energy*	*Total*	
Space-heating	Combustion heating (stoves)	—	—	45	45	2,200
	Central heating: (a) by coal	—	—	60	60	1,666
	(b) by fuel-oil	—	—	65	65	1,540
	Gas heating	75	—(1)	75	57	1,750
	Electric heating: (a) by hydro-energy	70	90	80	50	2,000
	(b) by thermal energy	23	90	80	17	5,880
Cooking	Coal-fired range	—	—	10(2)	10(2)	10,000
	Gas cooker	75	—(1)	75	57	1,750
	Electric cooker: (a) on hydro-energy	70	90	66·7	42	2,380
	(b) on thermal energy	23	90	66·7	14	7,140
Traction	Steam locomotives	—	—	5	5	20,000
	Diesel-electric locomotives	25	—	85	21	4,760
	Electric locomotives: (a) on hydro-energy	70	90	85	53·5	1,865
	(b) on thermal energy	23	90	85	18	5,550
Mechanical energy (fixed plant)	Steam engine with boiler	—	—	18	18	5,550
	Diesel engine	—	—	30	30	3,330
	Electric drive: (a) by hydro-energy	70	90	80	50	2,000
	(b) by thermal energy	23	90	80	16·5	6,060
	(c) by back-pressure plant	70	90	80	50	2,000

(1) Figures not available.

(2) Exclusive of combined space-heating: where this is included, overall efficiency is 60–65 per cent.

high, appropriate economic measures will have to be introduced to ensure some degree of continuity in the utilization of production capacities. This is essential both economically and socially.

(3) Energy supply costs are affected by two factors which are for the most part outside the supplier's control—transport rates and fiscal charges. There are both transport tariffs and tax systems which are quite definitely political, whether it is fiscal aspects or protectionist arrangements favouring particular sources of energy or whether it is the repercussions of particular tax systems.

(4) Competition among sources of energy is very much affected by the different methods used in price-fixing, and the different price structures.

Future Energy Requirements and Supplies

A brief account follows of what ECSC has achieved so far in studies on the future trend in energy requirements and the supplies available to meet them.

The method employed does not differ fundamentally from the procedure usually followed in this type of work: first an overall estimate of requirements, then estimates for the separate sectors (in this instance principally the best-known sectors, although these represent only part of the total requirements), then forecasts of future production, and finally an assessment of import requirements, arrived at by computing the difference between total requirements and indigenous production.

The overall estimate of energy requirements is based on these hypotheses:

(1) The average yearly rate of increase in the gross national product of the six countries up to 1965 is calculated at 4·3 per cent.

(2) Elasticity of demand for energy over the same period is calculated at 0·79 (*i.e.*, a 1 per cent increase in the gross national product gives a 0·79 per cent increase in the demand for energy); this figure implies a reduction in specific consumption.

(3) Since the investment periods in the coal-mining industry, in particular, are so long, it is necessary in addition to work out the general trends for the ten years 1965–75: this has been reckoned as a yearly increase of 3·1 per cent in the gross national product and an elasticity coefficient of 0·83.

Alongside this overall analysis, estimates have been made of the trend of demand in various energy sectors, namely the power stations, the coking-plants, collieries' own consumption, and road and air transport. For the other sectors—industry, households, railways, and shipping—very general hypotheses had to be adopted, based chiefly on the trend in the gross national product and in industrial production. Overall energy requirements will increase by something like 3·5 per cent per annum up to 1965; from 1965 to 1975 the rate of increase is expected to be only 2·6 per cent. Over the twenty years this gives an average rate of increase of 3 per cent per annum.

The sector-by-sector forecast of requirements deviates very little from the overall forecast. At the same time, energy consumption in the sectors which have been specially studied —*i.e.*, power-stations, coking-plants, the iron and steel industry, and road and air transport—is rising faster than in the other sectors.

Indices for energy requirements	1955–65 (1955 = 100)	1955–75 (1955 = 100)
Thermal power stations	186	313
Coking-plants (total input) ...	130	153
Road and air transport	195	298
Sub-total	149	203
All other sectors	134	169
Total requirements	141	183

It may be of special interest to give some more information of future requirements of liquid fuels for road and air transport.

Consumption of motor fuel on the roads is determined by the size and composition of the vehicle park and the density of the traffic. These two factors are made up of a number of elements, such as the average income level, the cost of running a vehicle, the taxes on motor fuel, the state of the country's roads, etc.

TABLE IX

EFFICIENCY RATIOS AS BETWEEN OIL-FIRED AND COAL-FIRED PLANT β, FACTOR γ REPRESENTING ADVANTAGES OF FUEL OIL OVER HARD COAL NOT DIRECTLY CALCULABLE IN TERMS OF FUEL CONSUMPTION

Type of employment	*Type of plant*	*Industry, etc.*	β(1)	γ	$\beta \times \gamma$
Melting heat ...	Open-hearth furnaces, forging (hammer) furnaces, melting furnaces	Iron and steel industry	1·2–1·3	1·2	1·44–1·55
	Glass-melting furnaces	Glassmaking industry...			
Incandescent heat	Annealing hardening and reheating furnaces	Steel industry	1·2–1·3 (1·6)	1·15	1·38–1·5
Drying heat ...	Drying stoves	Agriculture	1·1 (1·6)	1·1	1·21
Refractory heat	Rotary furnaces (kilns)	Brick and cement industry	1·2–1·3	1·1–1·15	1·32–1·5
	Calcining ovens and kilns	Fine ceramics			
Steam-raising ...	Steam power plants, medium-sized boilers, baking ovens	Public and industrial electr. generation, textile industry, foodstuffs industry	1·1–1·2	1·1	1·21–1·32
Space-heating ...	Open fires, stoves, central heating ...	Industry, public buildings, households	1·1/1·25	1·2/1·35	1·32/1·7

(1) Figures in parentheses are extremes (not reckoned in for product $\beta \times \gamma$).

Against "space-heating", the two sets of figures under β and γ relate to mechanically-fired and hand-fired plant.

β = Efficiency of fuel oil as compared with coal efficiency.

γ = Other advantages of fuel oil as compared with coal (estimates).

Without going into too great detail, ECSC has endeavoured to estimate the consumption of motor fuel per vehicle on a uniform basis for the different Community countries. In order to do so, it was first necessary to convert the figures for the park of different vehicles in the six countries into theoretical numbers of vehicles comparable throughout the Community. The results of these estimates are shown in Table X. The next step was to estimate the probable increase in the motor vehicle parks (weighted according to consumption of motor fuel). This has been done in a special study, but it would take too long a time to explain the methods and the results of this study.

On the basis of this study, ECSC is reckoning on a certain reduction in consumption per vehicle as time goes on. With the expansion of the parks there will be an increase in motoring purely for pleasure (Sunday traffic and so on); at the same time, the number of vehicles fitted with diesel engines is steadily increasing.

TABLE X

CALCULATION OF ENERGY CONSUMPTION FOR ROAD TRANSPORT

Motor vehicle park in thousands, 1955

Country	*Motor cars* *A*	*Agricultural vehicles* *B*	*Motor cycles* *C*	*Total** *D = A + B + C*
Belgium ...	599·6	4·7	65·0	669·3
France ...	3,310·0	62·5	425·0	3,797·3
Germany (West)	1,745·7	80·0	493·0	2,318·3
Italy	1,078·0	31·7	525·0	1 634·7
Netherlands	351·9	8·2	31·4	391·5

* The figures in columns B and C represent one-quarter of the vehicles known to exist: the principle is assumed that consumption by these vehicles is one-quarter that by a motor car.

Energy consumption in road transport, 1955

Country	*Theoretical motor vehicle park* (000)* *E*	*Energy consumption Tkcal* *F*	*Consumption per vehicle* 10^6 *Kcal* *G = F : E*
Belgium	669	12·1	18·1
France	3,107	50·3	16·2
Germany	2,319	49·3	21·3
Italy	1,337	24·0	18·0
Netherlands ...	339	11·2	28·6

* E = D for Belgium, Netherlands and Germany; $= D\frac{9}{11}$ for France and Italy. Consumption of motor fuel per 100 km averages 11 litres in the first three countries and 9 in the other two.

Fuel requirements of road and air transport 1955–1975

Country	*Requirements* 1955 *Tkcal*	*Indices* 1955/65 1955 = 100	*Indices* 1955/75 1955 = 100	*Total requirements* 1965 *Tkcal*	*Total requirements* 1975 *Tkcal*
Belgium ...	12·1	180	270	22·0	33·0
France ...	50·3	185	275	93·0	138·0
Germany + Saar	50·0	200	300	100·0	150·0
Italy	24·0	210	340	50·0	82·0
Luxembourg ...	0·4	180	270	0·7	1·1
Netherlands ...	11·2	210	320	23·3	35·9
Community ...	148·0	195	298	289·0	440·0

Air transport requirements, which in 1955 accounted for only one-tenth of the total, are estimated to be five times as high in 1975, and to represent one-sixth of the total.

As a result of all this, the conclusion was reached that fuel requirements for road and air transport will nearly double until 1965 and nearly treble until 1975. For details see Table X.

In general, the fact that the requirements of the sectors studied separately increase more steeply than overall requirements follows from the character of these sectors. If the results of the two studies are compared, as it is done in Table XI, it is shown that the figures appear to tally very satisfactorily. The agreement however might be more apparent than real. The two estimates are only largely, but not wholly independent, so that the almost complete agreement between them may be due to a chance balancing-out of errors.

TABLE XI

FORECAST OF ENERGY REQUIREMENTS, ACCORDING TO DIFFERENT METHODS, 1955—1965—1975

	Tkcal 1955	*Tkcal* 1965	*Tkcal* 1975
Requirements of sectors studied separately	1,545	2,295	3,131
Requirements of other sectors ...	1,279	1,710	2,160
Total requirements	2,824	4,005	5,291
Overall forecast	2,824	3,991	5,183
Requirements of separate sectors in per cent of overall requirements	54·5	57·5	60·5

Production of conventional energy in the six countries will definitely not be sufficient to cover requirements. The Community is already a net importer of energy, but in the next few years it will become a much bigger one. On the basis of ECSC hypotheses as to the general trend, energy requirements, and energy production, it is concluded that net imports will have more than doubled by 1965, and more than trebled by 1975 (see Table XII).

Gross energy imports by the Community in 1955 were valued at approximately $2000 million, and net imports at approximately $1100 million. It is difficult to say in advance

TABLE XII

ENERGY PRODUCTION, NET IMPORTS, AND ENERGY REQUIREMENTS OF THE COMMUNITY

	1955	1965	1975
Tkcal			
Production of conventional energy	2,231	2,668	3,060
Net imports and nuclear energy...	593	1,323	2,123
Requirements	2,824	3,991	5,183
Indices			
Production of conventional energy	100	120	137
Net imports and nuclear energy...	100	223	358
Requirements	100	141	183
Percentages			
Production of conventional energy	79	67	59
Net imports and nuclear energy...	21	33	41
Requirements	100	100	100

whether the Community will continue re-exporting valorized energy in future: probably it will, but only on a reduced scale. So it is quite likely that its future energy imports will be somewhere in the region of $3000–4000 million. This enormous expenditure will be hard to reconcile with the need to maintain a positive balance of payments. Even to-day energy imports account for 15–20 per cent, indeed in certain cases up to 30 per cent, of the total imports of raw materials. As time goes on it will become more difficult to earn the currency to pay for imports. For some countries this means that the extent of their all-round economic expansion will be determined by the amount of energy they can obtain.

These prospects will compel the countries of the Community to institute as quickly as they can, as part of their overall energy policy, a nuclear-energy programme on about the same scale, relatively, as that of the United Kingdom. The targets for such a programme are laid down in the Report of the Three Wise Men, with which you are probably familiar. ECSC's present studies are leading to the same conclusions as that Report. The Community has also established that conditions in the six countries are suitable for the implementation of such a programme. Conventional energy in Western Europe has become scarce and expensive. So nuclear energy will become competitive in these countries sooner than it will in countries possessing cheap supplies of crude energy. The sooner the Three Wise Men's targets are attained—that is, the installation of nuclear capacity totalling 15 million kW—the sooner will countries of the Community be able to bring net energy imports in line with the overall development of their balance-of-payments position.

FOUNDATION PILE DRIVEN AT ESSO'S ROTTERDAM REFINERY

On 19 May the first foundation pile was driven on the Botlek site of the new Esso Refinery at Rotterdam, which is scheduled to commence operations in 1960 to supply at first the Dutch market and ocean shipping bunkering in Dutch harbours. Ultimately a large proportion of its output will be exported.

In a speech to the press, H. O. Horstmann, director of Esso Nederland N.V., stated that the site had an area of 172 hectares and a frontage to the Third Petroleum Harbour of 1600 m. Its capacity would be 95,000 b.d. and about one-fifth of this quantity would be derived from crude from the Dutch soil. Fifty per cent of the production of the Netherlands Petroleum Company will be processed at Rotterdam, and the remaining crude would be imported.

Singled out for special mention by J. A. Beukers, general manager of Esso Nederland N.V., were six features of the new refinery. These were the curtain-wall construction of the administrative building, the floating-roof tanks, the airfin coolers, the powerformer process, the use of electronic instruments, and the method of loading barges.

The administrative building which consists of four floors is constructed on the basis of a concrete skeleton made up of floor panels supported on concrete columns. In the centre of the building, structural reinforcement has been provided to absorb wind loads and reduce the size of the columns. The walls of the building serve simply to enclose the area and have no share in supporting the building; they are clad mainly with aluminium and plastic and thus form a "curtain wall".

Floating-roof tanks are new to the Netherlands and the tanks at Rotterdam will have a diameter of 45 m and a height of 14·5 m with a capacity of 24 million litres.

The cooling equipment to be installed will be of the air-cooled instead of the more conventional water-cooled type since the former offers economic advantages and obviates any danger of pollution of the water used by small quantities of oil.

The "powerformer" process was developed by Esso Research and Engineering Co. and uses a catalyst to produce a high-octane gasoline. In this process the catalyst is stationary and only one reaction-container is needed in which the catalyst operates and can be regenerated. The process is claimed to operate more effectively and efficiently than previous platformers. The platinum catalyst required will be manufactured in the Netherlands and supplies will also be available for other installations planned for Western Europe.

The decision to use electronic instead of the normal pneumatic instruments to control various processes, the boiler-house, and some other installations was based on the fact that electronic instruments, though more expensive, can be easily repaired or moved and replaced by new ones. They respond more quickly and occupy less space on the control panels. Electronic instruments will also measure fluid levels in tanks where accuracy is of paramount importance.

Loading time of barges is reduced by the provision of a system of racks as used for loading tank trucks on railways. This permits loading from overhead. A ship-to-shore telephone enables captains to report directly and receive instructions on their next journey and loads. Requisite loading papers will be conveyed to the piers by a vacuum-tube system.

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GAS CHROMATOGRAPHY DISCUSSION GROUP

In the August issue (page 289) reference was made to the informal symposium which this group is holding in the Chemistry Department of University College on 23 September. Although the Discussion Group was ascribed to the Department of Scientific and Industrial Research it should of course have been given as the Gas Chromatography Discussion Group of the Hydrocarbon Research Group of the Institute of Petroleum.

★ ★ ★

MIDDLE EAST OIL PRODUCTION

	June	*Jan.–June*
	Tons	
Iraq Petroleum Co. Ltd ...	1,985,236	9,963,980
Basrah Petroleum Co. Ltd ...	892,359	5,188,536
Mosul Petroleum Co. Ltd ...	103,930	634,488
Qatar Petroleum Co. Ltd ...	613,929	3,947,974
Iraanse Aardolie Exploratie en Productie Mij	3,147,000	19,354,000
Kuwait Oil Co. Ltd	5,607,403	33,423,621
	Barrels	
Arabian American Oil Co. (Saudi Arabia)	28,539,385	179,427,860
Bahrain Petroleum Co. Ltd ...	1,211,317	7,891,679

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for June was 1,340,000 tons, the total for 1 January to 30 June being 7,637,000 tons.

Crude processed at Aramco's Ras Tanura refinery during June amounted to 4,028,662 brl, the total for 1 January to 30 June being 31,891,438 brl.

Oil deliveries from Sidon, Lebanon, by Trans-Arabian Pipe Line Co. in June were 11,443,022 brl, the total for 1 January to 30 June being 64,598,855 brl.

Fifty Years of Iranian Oil

During the week commencing 10 March 1958 special celebrations were held in Iran to mark the Fiftieth Anniversary of the Iranian oil industry. The proceedings were inaugurated by His Imperial Majesty the Shahinshah and many guests from overseas were present.

Following a visit to the Mausoleum of Reza Shah the Great on the Monday morning, the delegates and guests assembled at the Ebne-Sina Hall, Tehran University, for the opening ceremony. This was performed by the Shah, who said:

"It is with great pleasure that we open to-day the 50th Anniversary Celebrations of the Iranian Oil Industry.

"The oil industry has rendered great and notable service towards the expansion of Iran's economy and industry and we are hopeful that further successes will be achieved on the road to progress.

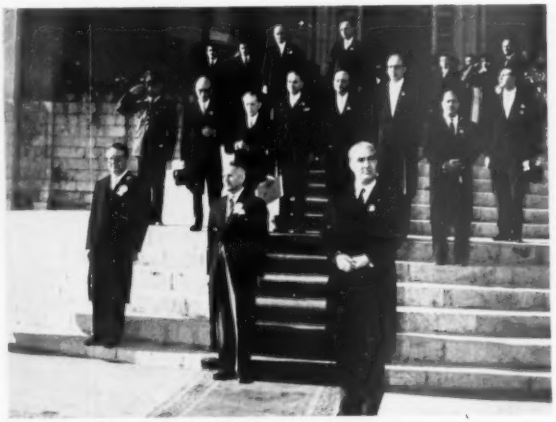
"The Almighty has endowed our land with vast petroleum resources and it is our earnest desire that full advantage be taken of these resources for the betterment of our people at the earliest possible opportunity. To that purpose the petroleum law has been enacted and has been entrusted to the National Iranian Oil Company for implementation.

"We are confident that this will be successfully carried out and that we shall be witness to great progress in this direction. We feel equally confident that it will not be long before the National Iranian Oil Company takes its place in the ranks of the great oil companies of the world."

Following the speech by His Majesty, a report on "The Iranian Oil Industry, Past, Present, and Future", was given by H.E. Abdollah Entezam, chairman of the board of the National Iranian Oil Company. In the evening the delegates were guests of the NIOC at a dinner at the officers' club.

Tuesday afternoon was devoted to the presentation of papers. The first session, under the chairmanship of H.E. J. Sharif Emami, Minister of Industry and Mines, heard a paper "Oil Exploration in Iran" by F. Naficy, a director of NIOC.

During the second session James A. Bermingham read a paper on "Drilling of Ahwaz No. 5, Key Exploration Well in Khuzistan". The chair was taken by H.E. K. Taleghani, Minister without portfolio.



The Prime Minister and NIOC directors awaiting His Majesty's arrival

A visit to the Alborz oilfield, Qum, was made on Wednesday and the afternoon of Thursday was occupied with two meetings. At the first A. Ittehadieh, a director of NIOC, spoke on "Oil Marketing in Iran", the chairman being the Minister of Labour, H.E. A. K. Bakhtiar. Chairman of the second meeting was H.E. Dr Issa Sadiq, Senator, Member of the Petroleum High Council, and a talk was given by Sir Stephen Gibson.

During Thursday evening the party left by train for Ahwaz, leaving that town the following day by plane for Masjid-i-Suleiman. On Saturday, No. 1 well and the installations at Masjid were visited, the delegates then proceeding to Agha-Jari and later to Abadan. Sunday morning was occupied by a visit to Abadan refinery and after luncheon the delegates departed for Tehran or overseas destinations.

The Papers

The *IP Review* has been fortunate in obtaining copies of the papers referred to above and these are summarized below:—

The Iranian Oil Industry, Past, Present, and Future
By H.E. Abdollah Entezam

On 26 May 1908 drilling at Masjid-i-Suleiman resulted in a gusher of oil from 1180 feet and was the culmination of hopes entertained by many since the second half of the 19th Century.

In 1872 petroleum rights throughout Iran were granted to Baron Julius de Reuter. This was withdrawn later but in 1890 the Baron acquired another concession related to banking and mines. The Persian Bank Mining Rights Corporation was formed in 1890 but, failing to discover substantial resources, was liquidated in 1893.

In 1895, de Morgan wrote of a "zone pétrolifère" stretching from Kirkuk down to the Gulf. This came to the notice of D'Arcy, who was eventually granted the sole right to find, exploit, and export petroleum throughout Iran excepting the five Northern Provinces. In the spring of 1903 oil was struck at about 1670 feet at Chiah-Surkh, then in Iranian territory, but was insufficient to justify a pipeline to the sea.

On 21 May 1903 D'Arcy founded in England "The First Exploitation Company", and in 1905 the Burmah Oil Company took over the D'Arcy enterprise and formed the "Concessions Syndicate Ltd".

Drilling started at Ram Hormoz late in 1906 was unsuccessful and a final attempt at Masjid-i-Suleiman was rewarded and the Anglo-Persian Oil Company was formed in 1909. Thus, an oil industry came into existence and was to contribute not only to Iran's and Britain's economy but also to the Allied cause in two world wars.

Construction of Abadan refinery commenced in the winter of 1909 and came into operation in 1913. In June 1911 a 233-km pipeline from the field to Abadan was completed and had a capacity of 400,000 tons annually.

Subsequent oilfield discoveries were: Naft-i-Shah 1923, Gach Saran and Haft Kel 1928, Naft-i-Safid 1934, Agha Jari and Paznun 1937, Lali 1938. Some were not exploited until some years later.

Production expanded from 80,000 tons in 1912 to 32 million in 1950 and was 3 million tons higher in 1957. In 1950, Abadan refinery was capable of processing 25 million tons of crude annually. It does not function at full capacity to-day but it is hoped that it will do so before long. In the 36 years to 1947 Iran contributed 210 million tons of crude oil and products to world energy supplies and to date has supplied a total of 416 million tons.

With nationalization of the oil industry in 1951 the National Iranian Oil Company came into existence and in 1954 an agreement

The Shah of Iran with some of the delegates

for the sale of Iranian oil was concluded with a Consortium of eight companies representing international interests. The Consortium was given rights of use of all fixed assets located within the agreement area.

The NIOC carries out practically all oil operations, except exploration; outside the agreement area, exploration is done by a subsidiary, the Iran Oil Company.

In August 1956, oil was struck in the Alborz area, about 80 km south of Tehran, and this field is now being developed.

Internal distribution of petroleum products in Iran is the exclusive right of NIOC and between 1946 and 1956 internal consumption was more than trebled. Prices are kept as low as possible and although between 1937 and 1957 cost of living in Iran rose by 13 times, oil prices less than trebled. To reduce transport costs a 10-in 820-km product pipeline has been constructed from Ahwaz to Tehran, and two 6-in branch lines are to be laid from Azna to Isfahan and from Tehran to Resht.

To define the terms of future oil agreements the Petroleum Bill was passed in 1957 and vested the NIOC with the right to divide the country into oil districts, to receive tenders for exploration rights, and to negotiate agreements.

In August 1957 an agreement with AGIP-Mineraria was signed to cover two land and one offshore area. A joint company, SIRIP, has been formed. Also, three districts in the south have been declared open for bidding and many tenders received.

A variety of activities are planned by NIOC including, as soon as commercial production has been proved in the Alborz area, a refinery in the north and a trunk pipeline from there to the Mediterranean.

Oil Exploration in Iran. *By F. Naficy.*

The first oil exploration work outside the concession area of the former Anglo-Iranian Oil Company was by Swiss geologists of the Société Franco Persane de Recherche in 1929–31. Geological studies were made in Semnan and part of eastern Mazandaran and two shallow wells were drilled east of Babolsar. No positive results were obtained.

In 1935, oil indications at Ghanat led to the decision to form an Exploration Engineering Department in the Ministry of Finance to carry out oil operations in central and northern Iran. Activities began in Qum and at Mazandaran and three wells were drilled, two at Kheshtsar and one near Kuhe-Namak. These operations ceased in 1939 without success.

An agreement was signed with the Amiranian Oil Company in 1936 and some investigations were carried out in the Gorgan Plain, Sistan, and Northern Baluchistan in 1937–38. In 1939 an agreement was made with the Allgemeine Exploratie Mij but work had to be discontinued when the war began.

The Iran Oil Company was formed in 1949 to explore for oil outside the concession area and in January 1954 its ownership was transferred to the NIOC. Geological work started in March 1950 with four Swiss and two Iranian geologists. In addition to the difficult nature of the territory there was a serious shortage of Iranian trained personnel. By the beginning of 1958, however, NIOC had succeeded in forming an exploration department of 159 qualified technicians made up of 63 Iranian geologists, petroleum engineers, drillers, etc., 28 expatriates directly employed by the Company and 30 working through contracts, and 38 Iranian technicians engaged directly in oil exploration. During 1957 two wells were drilled entirely by Iranian drillers.

To date a large number of trimetrogan and vertical aerial photographs have been made over an area of 50,000 sq km and converted to photogeological maps. Nearly 200 sheets of detailed geological maps of a total area of 12,000 sq km have been made and some 900 geological sections and 400 stratigraphic columns have been prepared.

On 18 June 1951 the first well in the Alborz area at Qum was commenced and to the end of 1957 the total drilled footage was 75,000 ft.

Many thousands of geological samples have been collected and examined and the solution of complex geological problems has thrown much light on the geology of Iran.

Geophysical operations by gravimeter cover an area of 10,000 sq km in the Caspian alluvial zone, and seismic operations along the Caspian coast and in the central desert cover 15,000 sq km.

The discovery of oil in Alborz No. 3 on 3 July 1953 and the blow-out at No. 5 on 26 August 1956 prove that some of the assumptions and theories of NIOC geologists were correct.

To provide a basis for the future programme it is necessary to study markets and to estimate requirements. Experience shows that, except perhaps in the Iranian Continental Shelf, exploration will require eight years.

Domestic consumption in Iran in 1965 is estimated to be about 100,000 barrels per day, or 5 million metric tons per year. Assuming required reserves to be twenty times consumption, the minimum reserves in 1965 must be 750 million barrels or 100 million tons.

Consumption in 1965 in the parts of the world open to Iran oil is estimated at 1250 million tons a year. This market is shared with other oil-producing countries. If Iran's share of world markets is assumed to be 15 per cent, then in 1965 Iran will have to export 200 million tons annually. To achieve this Iran's present production rate has to be increased five-fold.

The area of sedimentary basins in Iran is over 800,000 sq km and the drillable part of the Continental Shelf is over 100,000 sq km. So far 250,000 sq km have been granted to the Iranian Oil Exploration and Producing Co. and 23,000 sq km to the Iran Italian Oil Co. (SIRIP). In addition, the area of the districts declared open is over 170,000 sq km, leaving about 450,000 sq km in the possession of NIOC as a national reserve.

Exploration facilities at present in operation in Iran are:

NIOC (*Iran Oil Co.*).—3 geological and 2 seismic groups; 4 heavy, 1 medium, and 1 small drilling rig. One rig is exploratory drilling at Sarajeh, and the others in the Alborz and Naft-i-Shah fields.

Iranian Oil Exploration and Producing Co.—2 geological, 2 topographical, 2 seismic, and 1 combined gravimetric and magnetic group; 2 heavy drilling rigs in Ahwaz and Binak; 3 heavy rigs for development and delineation of existing southern fields.

Iran Italian Oil Co. (*SIRIP*).—2 geological groups and 1 marine seismic group.

Based on the estimates of Pogue and Hill it is concluded that under favourable conditions a minimum capital of 82000 million must be spent in exploration, exploitation, transport, etc., before Iranian production reaches the optimum of 200 million metric tons a year.

The paper concludes with a critical analysis of the Petroleum Act of 31 July 1957.

Delegates to the Tehran Conference being introduced to the Shah

Drilling of Ahwaz No. 5, Key Exploration Well in Khuzistan
By James A. Bermingham

After outlining the general geology of Western Iran it is said that the first well at Ahwaz was drilled to a depth of 3317 ft during 1913–16. The Asmari limestone was not reached but a low-angle thrust fault in the Upper Fars was revealed.

In the winter of 1937–38 seismic refraction surveys were carried out and checked with a reflection survey. After the war, in 1945, the area was re-shot to locate more precisely the axis of the Ahwaz Asmari structure and to locate other geophysical prospects in the Dizful Embayment.

In 1948 a slim-hole test well, Ahwaz No. 2, was drilled to 7812 ft on a crestal location and reached the Caprock. For mechanical reasons the well was abandoned but it was confirmed that it was at or near the crest of an Asmari structure.

Ahwaz No. 3, located 2000 vertical feet down the flank of the structure and 1¼ miles east of No. 2, was commenced in March 1949 and was eventually abandoned for mechanical reasons at 9158 ft in September 1950. High-pressure water was encountered at 8500 ft and again at 9894 ft.

The next well, No. 4, was located 1 mile east of No. 3 and approximately 1000 vertical feet down flank. It was spudded-in in September 1950 and operations were suspended at 8960 ft in June 1951 when the former Company ceased operations.

Ahwaz No. 5, located close to and as a replacement for No. 3, was also commenced in September 1950 and had reached 8200 ft when general operations were suspended in July 1951. Operations on No. 5 were resumed in August 1956, the National 100 rig being still at the site and fully rigged up. The derrick was a 136-ft Oweco and the drawworks were powered by two Superior 385-hp diesels and hydraulically coupled. Mud system consisted of two National C–350, one C–250, and one C–150 pumps, the volume of the entire system being about 1000 barrels. Connected to the casing flange were a Cameron 1500 series double-ram blow-out preventer with a Hydril Type 6.K 1500 series blow-out preventer above.

As the bottom two joints of 13⅜-in casing had parted and dropped some 300 ft down the hole, extreme care was taken in cleaning out to the previous depth of 8200 ft. After cleaning, electric logs were run and then 9⅝-in casing was cemented at 8200 ft. Drilling proceeded normally to 8650 ft when an inflow of water reduced mud weight from 135 to 124 lb. After temporarily closing-in, the well-head pressure rose to 1475 lb in 6 hours. The well was filled with 148-lb mud and then a 152-lb mud was maintained.

It is believed that the high-pressure water zones in Ahwaz 2 and 3 were due to local folding with a local "trapping" of water by faulting, impervious beds above and below, and lateral changes in sedimentation. The result is a pressure 100 per cent higher than normal for the depths. Similar high-pressure waters have been noted in Agha Jari.

The lower water of No. 3 was not met in No. 5, the equivalent limestone being a thick salt interval.

A depth of 10,736 ft was reached in May 1957, the Caprock having been expected at about 10,000 ft. The Caprock was not reached until 11,172 ft and after penetrating 103 ft of it a 3180-ft string of 5-in liner was cemented at 11,275 ft.

Details were given of mud and pressure problems, and of a fishing job, all of which were successfully overcome.

Part of Abadan refinery from the top of the cat cracker

Incoming and outgoing pipelines at Abadan refinery

Top of the Asmari was encountered at 11,315 ft and the full 1385 ft of it was penetrated. Total depth of Ahwaz No. 5 was 12,742 ft, the deepest well ever drilled in Iran. The Asmari consisted of 589 ft limestone and dolomite, 348 ft sandstone, 98 ft siltstone, and 350 ft grey shale and marl.

Three production tests were made:

(1) 11,315–11,370 ft (top 55 ft). Displaced 87-lb mud with water —no flow. Displaced water with diesel oil—no flow. Spotted 16 per cent acid. Applied 3800 psi pressure. No fluid away.

(2) 11,315–11,454 ft (top 139 ft). As (1). No fluid away at 4000 psi.

(3) 11,315–12,742 ft. (Entire Asmari). Displaced 87–lb mud with water. Salt water flowed to sump at 8000 bd. Salinity, 191,000 ppm. Flow line temp, 192 deg F. Methane gas intermittently.

The well is to be used as an observation well. Although non-productive, Ahwaz No. 5 gave valuable information:

(a) It revealed a suitable and permeable reservoir in the Asmari in the Ahwaz area.

(b) It was learned that the possible maximum oil column in the Asmari is of the order of 3500 ft, greater than at M.I.S., Haft Kel, or Naft Safid.

(c) Data gained as to depth and thickness of various formations, plus a velocity test by the Geophysical Department, provided an improved structural and lithological interpretation of the area.

(d) Valuable experience was gained in overcoming unique and difficult drilling problems.

Ahwaz No. 6 is located in the crestal area to determine whether a gas cap or oil exists at the top of the structure. At the time the paper was read 18-in casing had been set at 997 ft, 13⅜-in at 3023 ft, and it was planned to set 9⅝-in at about 7700 ft in the Caprock. It is proposed to core the entire Asmari interval and possibly to drill to the massive Middle Cretaceous limestone at about 11,000 ft.

This well should conclusively answer the question: Has oil or gas accumulated in the Asmari reservoir under the large deep-seated structure of the Ahwaz prospect?

Oil Marketing in Iran
By *A. Ittehadieh*

Prior to the availability of indigenous oil products in Iran kerosine was marketed in the southern areas by Burmah Oil and Socony, and in the northern areas by the Russian agency Perse-Az-Naft. In 1928 the Anglo-Persian Oil Company opened a distribution office in Tehran. Competition was intense from then until the years after the second world war, when the whole market was supplied from oil produced and refined in the country.

During the last ten years the consumption in Iran of aviation and motor spirits, kerosine, gas oil, and furnace oil shows an annual average rate of increase of 14 per cent. Approximately 10 per cent of the total is consumed in the Metropolitan area.

Tankers at Bandar Mashur

Transportation of oil products has always been a major problem, but the new Trans-Iranian pipeline has taken a heavy burden off rail and road transport. At present the line operates at the rate of one million tons per annum from Abadan to Tehran. When the branch line from Azna to Isfahan is completed part of this will be diverted. The capacity is to be doubled in stages and it is proposed to extend the line from Tehran to Qazvin and Resht in the near future.

Railway capacity will be used in preference to more costly road transport for the carriage of heavy fuels on all routes and for other products where no pipeline exists. In coastal areas of the Persian Gulf transport by water is used.

There are some 1200 points where oil products are stored for sale ranging in capacity from one thousand to one million barrels.

The opinion that monopoly rights of distribution do not benefit the consumer needs close study. Under such a system, capital outlay for any volume of trade is less than that required for a competitive system. Where there is competition, facilities are inevitably repeated, resulting in higher capital outlay which alone could result in higher final costs.

The success of maintaining comparatively low prices in Iran is due to monopoly rights. In the last twenty years the cost of living has risen 1300 per cent but the price of oil products only 270 per cent. It is NIOC's intention to ensure that this vital source of energy is placed at the disposal of everyone on the most favourable terms and conditions.

Around the Branches

BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD

London Branch

When the Annual General Meeting of the Branch was held earlier in the year the following were elected as the committee for 1958–59:

Chairman	J. C. Jewell
Vice-Chairman	S. C. Price
Hon. Secretary	J. H. M. Clark
Hon. Treasurer	H. S. Kiernan
Chairman, Programme Sub-Committee	W. D. Davies
Other Members	A. G. Baxter-Shawe
	W. H. Davies
	R. F. Leach
	C. J. McManus
	N. E. Walters
	D. M. Watson

Forthcoming Meetings

A very full and attractive programme has been arranged by the sub-committee. The first meeting of the session takes place on the 22 September and consists of a talk on "Soviet Earth Satellites" to be given by O. K. Sapounov, who is Second Secretary of the Soviet Embassy in London. This talk is of particular interest and should prove to be most informative.

Other events in the forthcoming session include a talk in November by the immediate past-Chairman of the Branch, R. F. Leach on "Films in the Oil Industry". In December the popular Films Evenings at Shell-Mex House will take place.

The programme for the new year will begin with a Social Evening at the Chatham Rooms Restaurant in January and in February the branch will have the honour of being addressed by the President of the Institute, C. M. Vignoles, C.B.E. There will be two branch events in March, a luncheon meeting early in the month and later a talk by C. G. Tresidder on "The Purpose of Additives in Modern Gasolines".

The April Meeting will consist of a talk on "Oil in the Gas Industry" to be given by a well-known personality in the Gas Industry—Dr J. Burns.

The programme for the session will close with the Summer Outing in June.

IP ECONOMICS AND OPERATIONS GROUP

The full programme for the Group is not as yet finalized but the 1958/1959 Session will open on 9 October when E. H. J. Dixon (*Esso Petroleum Co. Ltd*) will open a discussion on "Economics and Forecasting in Road Transport". Other papers to be given before Christmas are "Transporting Liquefied Methane" by C. I. Kelly on 13 November, and "Road Tank Wagons" on 11 December by A. R. E. Calcott (*Mobil Oil Co. Ltd*).

Notes of the Month

The Petroleum Chemicals Industry in OEEC Countries

The findings of a working party of the OEEC Chemical Products Committee on Petroleum Chemicals, under the chairmanship of Professor G. Roberti of Italy, are summarized below.

The party met to review production of petroleum chemicals in member countries in 1957 and plans for expansion up to the end of 1960.

Their report showed that since 1945 total capital invested in the industry in Western Europe (in terms of plants in operation at the given date) rose to $550 million by the end of 1957. This represents an increase of nearly $140 million, or one-third, since the end of 1956. Investment is expected to rise even more rapidly to nearly $1200 million by the end of 1960.

Production has also shown a rapid increase. The total carbon content of petroleum chemicals produced in member countries rose from some 470,000 tons in 1956 to 630,000 tons in 1957, and the 1958 production is expected to be about 830,000 tons. As a result of investment planned up to the end of 1960 total production is expected to reach over 2 million tons, by that date. This expansion will cover all synthetic rubbers, polyethylene and ethylene oxide derivatives, solvents, and raw materials for plastics and detergents.

Progress of the Scientific Film Association

Encouraging progress during the year ended last March is reported in the Sixth Annual Report of the Scientific Film Association.

Membership increased by 25 per cent, information was published on 1250 films, eight meetings and a residential course were organized, and the Association participated in three major international conferences.

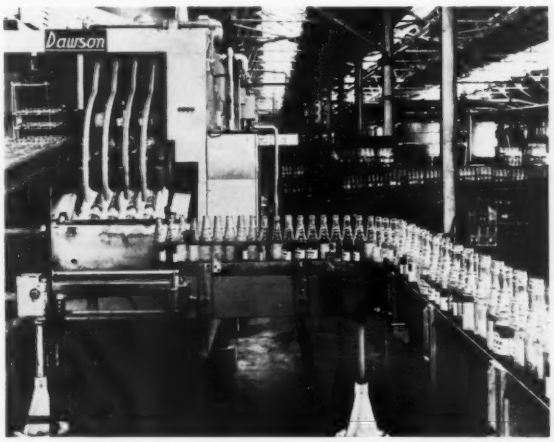
At the Annual General Meeting, Lex Hornsby, C.B.E., president for the third consecutive year, said the Association was unique in Britain as the only body which could express views on behalf of the film sponsor and film user alike.

At the meeting Bernard Chibnall, Shell Petroleum Co. Ltd, was elected vice-president for the session 1958–59.

Largest and Smallest in Australia

BP Australia Ltd's largest road tanker and smallest petrol pumps are shown together at the South Pacific Service Station on the Beach front at Bondi, New South Wales. The 45-ft-long tanker, which is powered by a Leyland Hippo diesel engine, carries 5400 gal of motor spirit and weighs more than 30 tons. The petrol pumps are only 4 ft 6 in high and have retractable hoses operating on a pulley system, which obviates the danger of hose loops catching on the bumpers of cars.

First Automatic Motor-oil Bottling Plant in Britain



The Esso Petroleum Co. Ltd have recently installed at Purfleet Terminal an automatic bottling plant for motor oils that has a potential output of 1500 pint and quart bottles per hour.

The new plant, which is claimed to be the first of its kind in Britain, was installed by Dawson Bros Ltd, Gomersal, near Leeds, and comprises washing, drying, filling, and sealing machines with conveyor-belt transport of the bottles.

The dirty bottles, after treatment with hot air, receive four washings in hot water and detergent solution and are then hot-air dried. In travelling to the filling machine the bottles are cooled to a suitable temperature by contact with the atmosphere.

Sealing, which is the next operation, is accomplished by the first Fords 6-head rotary sealer to be used for oil-bottling in Britain. This unit makes, embosses, applies, and seals the bottles with aluminium-foil caps.

The sealed bottles then travel to a collecting table for packing by hand into crates for distribution.

Mobilgas Economy Runs in South Africa and Europe

In a recent Mobilgas Economy Run, held in South Africa, a Riley 2·6 was the outright winner with an mpg of 32·8 (67·16 ton-mpg). In class B (800–1200 cc) the winner was a Morris Minor 1000 with 52·83 mpg (64·05 ton-mpg) and in class C (1201–1800 cc) an Austin A 55 won the overdrive section with 42·96 mpg (62·65 ton-mpg).

In the Scandinavian event the outright winner was a Volvo Amazon with 50·08 mpg. In the class for the largest-engined cars (1600–3500 cc) a Citroen DS 19 recorded 40·30 mpg to win its class.

In the Economy Run International from Brussels to Biarritz, George Heaps, driving a Standard Sportsman, was the winner of class VI (over 2000 cc) with 35·0 mpg over the 1696-mile course. Outright winner of the run and winner of class II (750–1000 cc) was F. Habrard of France in a Panhard Dyna with a consumption of 61·9 mpg.

World Oil Refining Capacity in 1957

Figures issued by the Petroleum Information Bureau show that the total world oil refining capacity increased by 62,300,000 metric tons in 1957 compared with the 1956 total. The most spectacular rate of growth was in Cuba where the 1956 capacity of 500,000 metric tons had increased more than eight-fold to 4,200,000 tons in 1957. Capacity was more than doubled in Puerto Rico by a rise of 1,800,000 tons in 1957. By contrast, there were declines in three countries. In Italy capacity fell from 28,700,000 to 25,400,000 tons during the year, in Brazil there was a reduction from 6,300,000 to 5,700,000 tons, and in Mexico from 18,200,000 to 17,300,000 tons. Details of capacity for the past two years and comparative figures for the last full pre-war year are given in the table below.

WORLD OIL REFINING CAPACITY

(Thousand metric tons average annual capacity at end-1957)

	1957*	1956	1938
U.S.A.	453,200	447,500	225,400
U.S.S.R. bloc	115,700	90,000	45,200
Canada	39,600	33,900	8,700
Venezuela	38,400	32,200	2,700
United Kingdom	33,500	31,000	1,900
France	32,900	30,500	7,600
Netherlands Antilles ...	32,500	32,500	21,400
Italy	25,400	28,700	2,100
Japan	21,000	16,100	2,600
Persia	19,200	†26,100	11,400
Netherlands	17,500	16,800	800
Mexico	17,300	18,200	4,900
Germany	16,200	14,800	2,400
Argentina	12,100	12,000	4,900
Indonesia	12,000	11,200	8,000
Saudi Arabia	11,300	11,300	—
Bahrain	11,200	10,200	1,600
Australia	9,800	8,600	‡
Trinidad	7,300	6,300	3,900
Belgium	6,900	6,400	600
Brazil	5,700	6,300	‡
India	5,500	3,900	‡
Aden	5,000	5,000	‡
Israel	4,300	4,300	—
Cuba	4,200	500	‡
Egypt	3,800	3,800	800
Spain	3,500	2,800	100
Colombia	3,500	2,200	700
Puerto Rico	3,400	1,600	—
Canary Islands	3,300	2,000	‡
British Borneo	2,500	2,400	1,000
Sweden	2,500	2,100	200
Austria	2,500	2,300	‡
Peru	2,400	2,400	1,100
Iraq	2,100	2,100	‡
Others...	15,000	11,900	3,700
	1,002,200	939,900	363,700

*Capacities shown are the latest available but may be subject to revision.

†Estimated figure includes capacity at Abadan prior to nationalization.

‡Included under others.

Chemical Research Grants

The Chemical Society Research Fund provides grants for research in all branches of chemistry. Applications for grants should be submitted, on the appropriate form, before 14 November to the general secretary, The Chemical Society, Burlington House, Piccadilly, London, W.1.

New Metropolitan-Vickers Irradiation Laboratory Opened

A new irradiation laboratory has been opened at Metropolitan-Vickers' Barton works, some two miles distant from the Company's main works at Trafford Park. It will provide an irradiation service for other firms and organizations interested in the possibilities of electron irradiation as an industrial process.

Initial interest will undoubtedly be in certain applications for which irradiation has already been demonstrated as of likely advantage. Such applications include the disinfestation of grain; preservation of foodstuffs; sterilization of pharmaceuticals, dressings, and sutures; curing of rubbers; processing of plastics, including polymerization, cross linking, chain scission, and graft polymerization. The laboratory service will provide for specific investigations, without involving the interested parties in purchase of equipment and maintenance of trained personnel. The service will also cater for a limited amount of contract work.

For a number of years, the Metropolitan-Vickers Research Department has been carrying out trial irradiation for interested organizations, who have co-operated on the basis of exchange of information.

The new laboratory is a self-contained unit and its main item of equipment is a 4-MeV linear accelerator designed for irradiation techniques. To it is fitted a beam-scanner with an output window of pure aluminium foil, which enables the beam to scan an area of 12 inches × $\frac{3}{4}$ inch at the window. Greater areas can be covered by adjusting the position of the scanner, which entails some loss of intensity, or by passing the material through the beam several times.

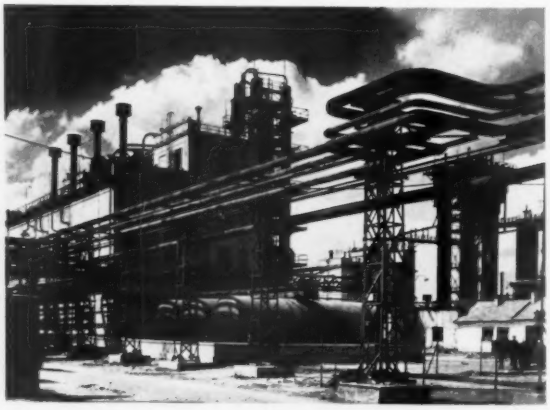
A variable-speed conveying system allows the continuous passage of material through the electron beam, and a work holder giving 4 degrees of freedom can handle articles in small number or of irregular shapes.

The whole equipment is controlled from a station outside the accelerator room; interlocks are fitted to all doors so that the equipment is rendered safe before access to the treatment and accelerator room is possible.

First Benzole Refinery in Hungary

The first benzole refinery in Hungary, at Sztalinvaros, began a 90-day test run in mid-July.

Built at a cost of £1·14 million, erection began in early 1956, and the plant will produce sufficient crystal benzole to meet Hungary's domestic needs and also to permit limited exports.



The Role of Computers in Future Refineries

The refineries of the future may contain computers that will anticipate changes in product demand dependent on weather and market conditions and that will then automatically make adjustments so that the right products are manufactured at the right time and in the right quantity.

E. Duer Reeves, executive vice-president of Esso Research and Engineering Co., cited this possibility in a recent talk to the American Institute of Chemical Engineers in Philadelphia. His subject was the impact of future technical developments on management and he considered that such advances would make management's role more complex and challenging. Some extracts from his address are given below.

"The province of the machines is the past. They can remember, they can compute established relationships, and do it all with incredible speed. But their only knowledge of the future comes from the mirror of the past.

"The future is the province of management—the development of new facts, new relationships, and new objectives. The difference is called imagination, or curiosity, or determination, or leadership. These qualities spell progress and I do not expect to see them emerge from machines."

Mr Reeves forecast great changes in industry and said, "Something new is about to be added in the form of feedback control with the use of memory-equipped computed systems. As a result, we can expect in the future to see many factories in which the heart is a computer whirling away and blinking its lights, as a result of which machines are continually changing operating conditions and making different products from time to time, with no apparent external signals."

First Women Journalists Down Shale Mine

A party of women journalists from more than a dozen Scottish newspapers were able to see for themselves recently how shale is won from the shale pits of Scotland, how the crude oil is extracted, and how the products, including the basis for By-Prox detergent, are obtained. As guests of Irano Products Ltd and Scottish Oils Ltd, they were the first party of women journalists to be taken down the Westwood pit, 12 miles from Edinburgh, since it began operating in 1916. They also toured BP's Pumpherston refinery where By-Prox is manufactured.

New Elastomers Research Laboratory

Du Pont Co. (United Kingdom) Ltd is to construct at Hemel Hempstead a new research laboratory, which will duplicate mill equipment and conditions found in the British rubber processing industry.

Research will be directed to solving problems of individual plants and will include compounding, processing, and testing of synthetic rubber compositions and products. The laboratory will be equipped with mills and internal mixers, processing machines such as calenders and extruders, and steam-heated hydraulic presses, autoclaves, and circulating-air ovens for vulcanizing. Special machinery will prepare solutions and water dispersions of neoprene and similar equipment will process the Company's Hypalon synthetic rubber, Adiprene urethane rubber, and Viton synthetic rubber.

Other machines will test tensile strength, abrasion resistance, hardness, flex resistance, compression set, and chemical resistance of elastomers both at the time of manufacture and after aging.

New formulations and processing techniques will be developed and tested and prototypes will be manufactured at the laboratory, which will also be used as a demonstration and proving area. Testing of products made from Du Pont synthetic rubbers will be demonstrated on equipment simulating service conditions. Engineers and rubber-industry experts will be welcome to the laboratory to observe and evaluate experimental methods of compounding, processing, and testing. The laboratory will co-operate with the rubber industry in the U.K. and Europe in establishing standards of quality and uniformity.

Rubber manufacturers will still be able to obtain research and technical assistance from the Elastomers Laboratory at Chestnut Run, near Wilmington, Delaware, U.S.A., through Du Pont Co. (United Kingdom) Ltd.

Du Pont does not manufacture finished rubber products, but supplies neoprene and Hypalon as raw materials to rubber manufacturing companies.

Neoprene possesses the fundamental characteristics of natural rubber and several additional properties; its outstanding advantages are resistance to deterioration from oil and grease, sunlight and weather, heat, flexing, and chemicals. Neoprene products do not support combustion and are impermeable to many gases which diffuse rapidly through ordinary rubber.

Hypalon synthetic rubber has high resistance to deterioration from oxidation from ozone, sunlight, weather, and oxidizing chemicals, and very good retention of a wide range of colours even after long exposure to weather.

City and Guilds Examinations 1958–59

For the session 1958–59 the City and Guilds of London Institute has introduced revisions in the syllabus for their examination in Fuel Technology at the Advanced Grade. The papers in Mechanical Engineering, Electrical Engineering, and Chemical Engineering have been amalgamated to form Fuel Engineering in which there will be two papers in the examination. This means that the examination will now consist of six instead of eight papers.

The Institute also sets examinations in Petroleum and Petroleum Products, Technology of Plastics, Technology of Gas Manufacture and Supply, and Chemical Plant Operation.

General regulations and syllabuses for specific subjects can be obtained from City and Guilds of London Institute, Gresham College, Basinghall Street, London, E.C.2.

First Synthetic Glycerine Plant in Europe Starts Production

The first plant in Europe, and the only one outside the United States, to manufacture synthetic glycerine has now come on stream at Royal Dutch Shell's Pernis refinery.

The plant, operating on a continuous basis, is the final section of a complex installed to manufacture a range of related industrial chemicals, the first unit of which was brought on stream in December 1956. Its products will make a valuable contribution to the reduction of dollar imports.

Colorado School of Mines Distinguished Achievement Medals

At a ceremony at the 84th annual commencement of the school, Dr J. W. Vanderwil, president of the Colorado School of Mines, presented the School's highest award, the distinguished achievement medal, to five graduates of the School.

Two petroleum engineers were among this year's five recipients of the medal. They are Martin E. Chapman, of Tulsa, independent oil operator and vice-president of the Breckenridge Investment Corporation, and Ralph J. Schilthuis, of Houston, director and vice-president in charge of production for the Humble Oil and Refining Co.

Bonny River Well is Dry Hole

An exploration well on the bed of the River Bonny, 40 miles south of Port Harcourt, in the Eastern Region of Nigeria, has been drilled by Shell-BP to a final depth of 12,023 ft and has proved to be a dry hole.

New Mobil Bulk Fuels Terminal

By the end of this year Mobil fuels will be distributed in parts of Derbyshire, Nottinghamshire, Yorkshire, and the Lindsey area from a new bulk fuels terminal now under construction adjacent to the River Trent at Gunness Grove, Lincolnshire.

The terminal, which will have a capacity of 1·2 million gallons and will be supplied by coastal tankers from Coryton, will be leased to Mobil by F. T. Everard & Sons Ltd, as part of that firm's bulk liquid storage installation at Gunness Grove.

Fuels to be handled will be Super Mobilgas Special, Mobilgas Special, Mobilgas, Mobil diesel, and Mobil gas oil.

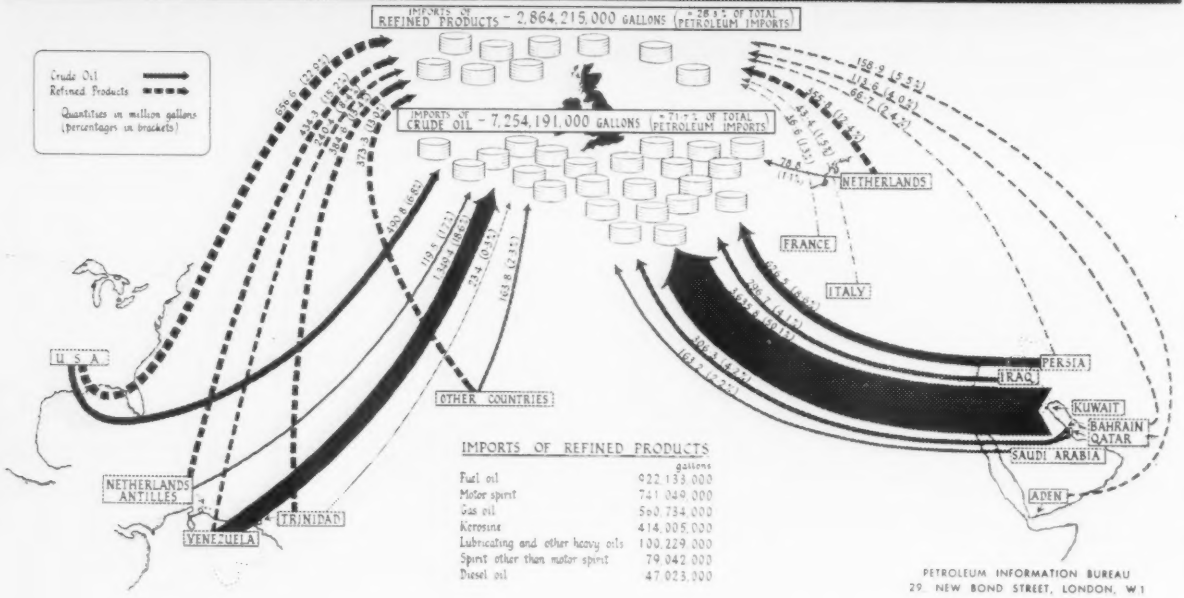
First Blue Star Garage in Wiltshire

The first filling and service station to be operated in Wiltshire by Blue Star Garages Ltd was recently opened in Devizes.

The new garage, which is built on the site of a former filling station, comprises showrooms, service bay, workshop, and offices. Its exterior is distinguished by a cantilever reinforced concrete canopy that projects some 16 ft from the main walls and gives protection to the petrol pumps. This canopy is a copy of the first canopy of this type used by Blue Star at their London Airport premises.

The building was the responsibility of T. J. Mobley, manager of Blue Star Garages' estates department and operations at the garage will come under the control of G. P. Floyd, A.M.Inst.Pet., western divisional manager of Blue Star Garages Ltd.

U.K. Imports of Crude Oil and Refined Liquid Petroleum Products—1957



IMPORTS OF REFINED PRODUCTS

	gallons
Fuel oil	922,133,000
Motor spirit	741,049,000
Gas oil	560,734,000
Kerosine	414,005,000
Lubricating and other heavy oils	100,229,000
Spirit other than motor spirit	79,042,000
Diesel oil	47,023,000

PETROLEUM INFORMATION BUREAU
29, NEW BOND STREET, LONDON, W1

Progress in the U.K. Gas Industry

The gas industry in Britain has taken full advantage of new technical developments and processes for the production of gas and is keenly interested in research and new projects. This is clearly apparent from a supplement issued by *The Times* on 2 June, under the title *The Future of Gas*.

In the search for new sources of supply the Gas Council, since nationalization of the industry on 1 May 1949, has made use of methane drained from mine workings of the NCB, refinery surplus gas, and LPG. The Council's Midlands Research Station at Solihull has brought to the stage of development on a commercial scale a process for the gasification of small coals at a pressure of some 30 atm, and work is in progress on the conversion of a motor ship to transport some 2000 tons of liquid methane to the special storage tanks of the North Thames Gas Board on Canvey Island.

The products of the petroleum industry are being increasingly used in gasmaking, and in 1957 600,000 tons of oil was used for this purpose. Catalytic oil gasification plant, which was first installed at conventional gasworks to supplement production of coal gas and carburetted water gas, now has a total rated capacity of 120 million cu. ft/day of gas from some 40 units, either installed or ordered. Later this year, two projects of special interest to the oil industry are expected to come into operation. At the Romford gasworks of the North Thames Gas Board four Onia-Gegi units, with a total rated output of 36 million cu. ft/day, will convert refinery tail gas from Shell Haven to town gas. At the Isle of Grain four units of Segas plant are being initially installed. These will have a daily output of 20 million cu. ft, but the site is planned for expansion to three times this capacity.

In the South Western Gas Board's area three oil gasification plants, operating on the Jones system, are situated in the Gloucester/Cheltenham Division and are converting 40 per cent of the oil used to carbon black and are producing 2½ million cu. ft of gas daily.

At Partington, near Manchester, a plant developed from research by Dr F. J. Dent of the Gas Council's Solihull Research Station is under construction for the high-pressure hydrogenation of oil and coal. At first this plant will be developed and tested on a variety of oil feedstocks. The system of the new plant will comprise production and purification of hydrogen of more than 90 per cent purity by the complete gasification of oil (and at a later date, coal) at 400 psi with oxygen and steam. This hydrogen will be used to hydrogenate further oil or coal to produce gas of high calorific value.

At present two refineries in the south of England are augmenting domestic and industrial gas supplies by feeding surplus tail gases into the gasworks of the regional Gas Boards concerned. From Fawley 50,000 therms a day of refinery gas are being piped to the Southern Gas Board's Southampton works and Shell Haven is supplying 70,000 therms daily to the North Thames Gas Board's Romford works. The combined current usage of these two supplies of refinery gas, after conversion in a catalytic plant, is sufficient for the domestic needs of a city of 1¼ million population.

If the experiments on the import of liquid methane by sea are successful, it is envisaged that tankers of 30,000 dw tons might be built to carry the equivalent of 2000 million cu. ft of town gas at 500 Btu. Such additional source of supply, which is considered might cost less than gas produced by conventional methods, would be a valuable stabilizing factor of the price of gas supplied to the consumer.

Amongst the other articles in *The Future of Gas* special interest attaches to two short semi-technical accounts. One deals with the underground gasification of coal and the other with an experimental high-pressure underground reservoir for gas formed by construction of a cavity a quarter of a mile below ground level. The Supplement also considers the domestic uses of gas, supplies to new towns, and the history of the industry.

Award of Mario G. Levi International Prize

The Mario G. Levi International Prize for the advancement of chemical technology of fuel, which was instituted in memory of Professor Levi, director of the Institute of Industrial Chemistry of the Politecnico, Milan, has been awarded to Professor Carlo Padovani, director of Stazione Sperimentale per i Combustibili, Milan.

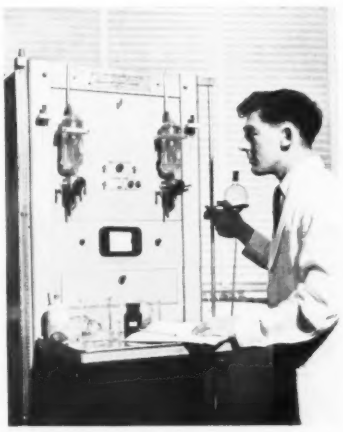
New Vapour Pressure Method Increases Accuracy of Gasoline Blending

Through more efficient gasoline blending, a new method of determining the vapour pressure of petroleum products, developed by Esso Research and Engineering Co., U.S.A., is expected to benefit both the refiner and the motorist.

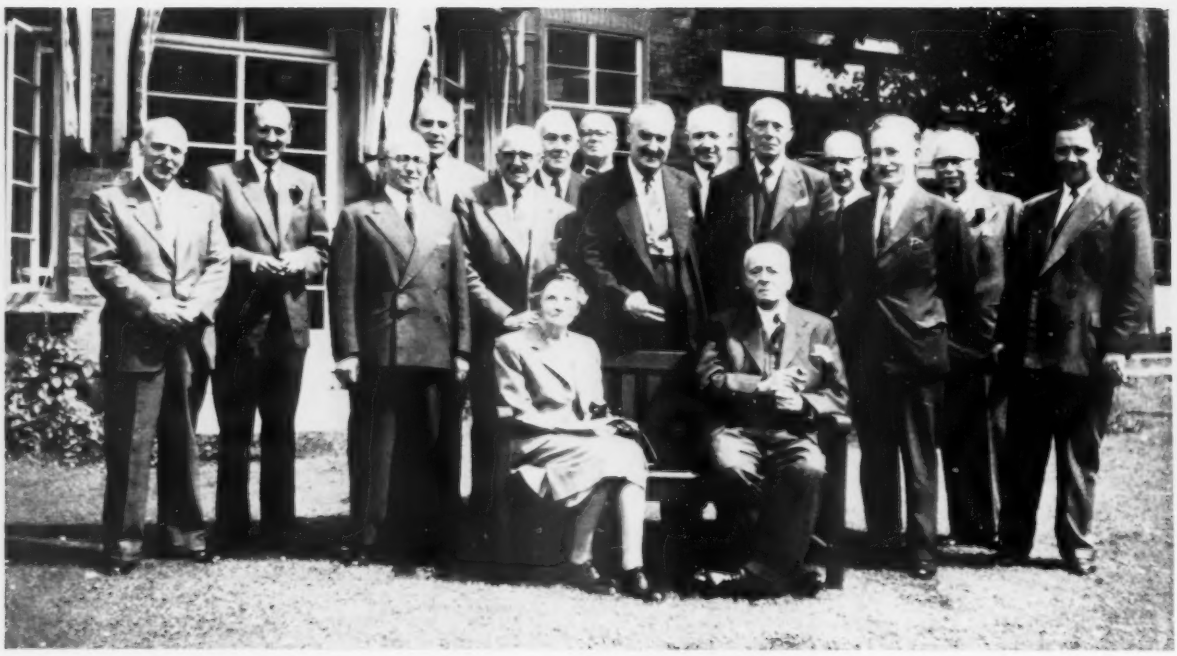
For more than a generation the standard method of measuring the vapour pressure of petroleum products has been the Reid method, but this has poor reproducibility and much unnecessary expense has been incurred in refineries through this lack of precision.

The new method, known as Micro Vapour Pressure (MVP), is claimed to have five times the precision of the Reid method and a determination can be made in 10 min instead of the 45 min required for the Reid. MVP results can, however, be correlated directly with Reid results so that they can be expressed in terms of long-standing usage.

The new apparatus is based on the principle that the vapour pressure of a liquid can be measured by introducing a sample of the liquid into an evacuated bulb fitted with means for measuring the pressure in the bulb before and after sample introduction.



Brian Turner, a laboratory operator at the Abingdon laboratories of Esso Research Ltd, is here using the new MVP apparatus to determine the vapour pressure of a sample of gasoline



Dr and Mrs A. E. Dunstan (seated) *with* (left to right) *W. H. Thomas, D. A. Hough, H. Hyams, E. J. Sturgess, E. A. Evans, R. B. Southall, E. J. Dunstan, C. M. Vignoles, Sir Stephen Gibson, Dr F. B. Thole, C. Chilvers, G. H. Thornley, A. C. Hartley, and C. S. Newey*

Dr and Mrs A. E. Dunstan Entertained

On 3 July members of Council of the Institute, led by the President, C. M. Vignoles, C.B.E., entertained Dr and Mrs A. E. Dunstan at a luncheon in the Garden House Hotel, Cambridge, in celebration of Dr Dunstan's 80th anniversary, which was on 25 January 1958.

Those accompanying the President were:

Past-Presidents:
E. A. Evans — Sir Stephen Gibson

Vice-Presidents:
H. Hyams — R. B. Southall

Members of Council:
E. J. Dunstan — E. J. Sturgess
A. C. Hartley — W. H. Thomas
C. S. Newey — G. H. Thornley

Honorary Secretary:
C. Chilvers

General Secretary:
D. A. Hough

Editor:
George Sell

Dr F. B. Thole, a former Member of Council, was also present.

C. M. Vignoles, proposing the health of the guests of honour, first referred to messages of congratulation which had been received from those unfortunately unable to be present. These included Lord Geddes, Sir Philip Southwell, W. M. Catchpole, G. H. Coxon, T. Dewhurst, and J. R. Moore, on behalf of the South-Eastern Branch.

He said that Dr Dunstan was not only a pioneer of the oil industry, he was almost one of its founders. It was over forty years since Dr Dunstan and Dr Thole had first established the Sunbury laboratory which had now become the well-known Research Centre of the British Petroleum Company.

Dr Dunstan, said the President, had first become a member of the Institute in 1916 and in 1919 was first elected to the Council. He was President during the period 1929–31, was awarded the Redwood Medal in 1938, and the Honorary Fellowship in 1946. His main interest in the Institute had been in its publications and for a quarter of a century he had been the Honorary Editor.

The President recalled a few incidents in Dr Dunstan's career and said they all hoped that both Dr and Mrs Dunstan would enjoy many more years of retirement.

Dr A. E. Dunstan expressed the pleasure of Mrs Dunstan and himself at the kindly thought which had given rise to the luncheon. He had many friends in the Institute and he recalled his early association with Sir Boverton Redwood in the

devising of tests relating to the pumpability of oils. It was Sir Boverton, he said, who had sponsored him when he joined the Institute in 1916.

He welcomed also the presence of George Sell, from whom he had had so much co-operation in the preparation of IP publications.

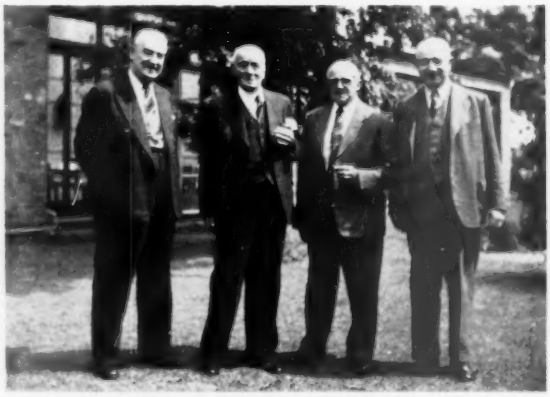
Concluding his remarks, Dr Dunstan referred to the camaraderie which existed and which had always existed among the Council of the Institute. He wished the Institute all success in the future.

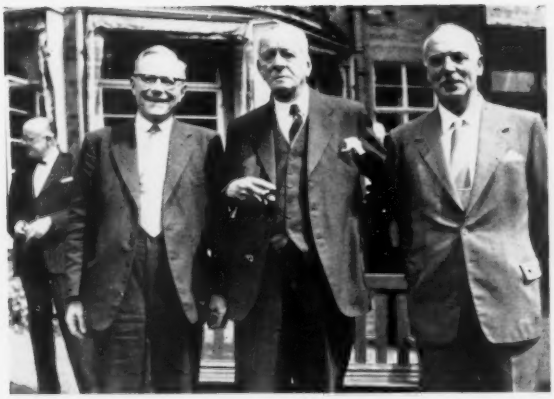
Mrs Dunstan added her thanks to those of Dr Dunstan, saying that the occasion would long remain as a happy memory.

Tributes to Dr Dunstan were paid by many present. In particular Dr F. B. Thole referred to his early association

(Right) *Founders of Sunbury Research Station gather together again. Drs Dunstan and Thole seated and W. H. Thomas standing*

(Below) *C. M. Vignoles, IP president, and three past-presidents, Dr A. E. Dunstan, E. A. Evans, and Sir Stephen Gibson*





(Above) *Dr Dunstan poses with his IP editorial colleagues* (left) *George Sell, IP editor, and* (right) *W. H. Thomas, who was an energetic worker on IP abstracts and other features in the early days*

(Left) *Dr and Mrs Dunstan at the luncheon*

with Dr Dunstan and W. H. Thomas mentioned the early days in the laboratory in the cellar at Sunbury. A vast amount of work was done in those days under somewhat arduous conditions and, said Mr Thomas, it was the spirit of enthusiasm then engendered by Dr Dunstan which had laid the foundations of the present eminence of the Sunbury Research Centre. George Sell expressed his thanks to Dr Dunstan for an association of nearly forty years standing. He had been happy to be associated with Dr Dunstan, not only in Institute work, but also in connexion with that monumental work of which Dr Dunstan was an editor—the *Science of Petroleum*.

At the invitation of Mrs Dunstan, members of the party later took tea with them in their house in Cambridge.

Monsanto's New Oil Additives Laboratory

Increased Facilities at Newport

Formally opened on 7 July by Harold Watkinson, M.P., Minister of Transport and Civil Aviation, Monsanto Chemicals Ltd new Oil Additives Technical Services Laboratories at Newport, Monmouthshire, represents a three-fold expansion of the facilities previously available at Fulmer in Buckinghamshire.

The new building has an overall size of 120 ft by 90 ft and a superficial area of 10,800 sq ft, compared with something under 3000 sq ft at Fulmer. The foundation slab which supports the entire building on the raft principle weighs 750 tons, but the foundations of the Caterpillar engines are structurally independent and each weighs 22 tons. Each of the latter has sixteen steel springs to absorb vibration.

Available Test Engines

The number of test engines available in the new laboratories is 27 compared with 14 at Fulmer. In addition there is a universal high-torque, high-speed, and shock test axle rig as a new facility.

The test facilities at Newport are:

(a) *Caterpillar.*—Beds are provided for six Caterpillar engines and dynamometer installations, five of the seven engines available being intended for standard 1-A testing. The remaining bed will be used for either of the other Caterpillars to carry out 1-D tests for Series II or Series III oils or 1-G tests for Series III oils.

For starting or motoring these engines, directly-coupled 10-hp 500 rpm electric motors are used in conjunction with Airflex couplings.

This laboratory is at present one large room but is designed to be divided into three, each containing two engine beds, if desired.

(b) *Chevrolet.*—In this room beds are provided for two Chevrolet rigs for the standard L-4 test. Load and speed are controlled by Heenan and Froude Dynamatic Mark 1 dynamometers. Space is available for a third multi-cylinder engine.

(c) *Petter AV.1.*—Provision is made for six Petter AV.1 engines or similar small diesels of equal horse-power. Power absorption is by means of 230-V, 50-cycle, 3-kW self-exciting alternators feeding load banks mounted in the monitor roof. Engine and alternator are on a cast-iron bed-plate supported on anti-vibration mountings.

Five beds are used normally for the 120-hour diesel detergency test laid down by the IP Diesel Engine Working Group. The sixth bed has an ac swinging field dynamometer and is used for such special purposes as the investigation of alkalinity effect on the performance of detergent oils.

(d) *Petter W.1.*—For use in screening tests for copper-lead bearing corrosion and the evaluation of oxidation stability, twelve Petter W.1 engines are installed in groups of four. The shafts are taken through the walls to the fan brake room.

All service and instrument connexions are brought to sub-panels on the wall behind the engines, the services and exhaust systems being housed in the fan brake room.

The screening test was developed by Monsanto, using a modification of the Petter engine, and is likely to be adopted as a standard test by the IP.

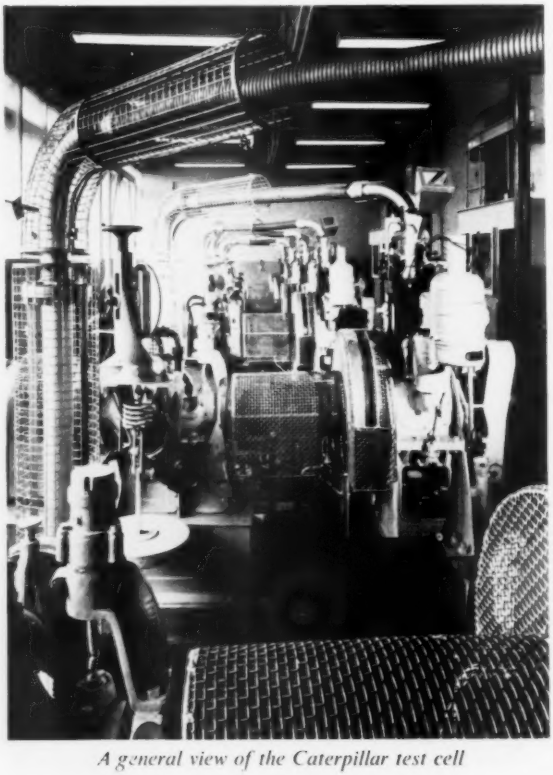
Special Engine Tests.—A test cell is available for use in carrying out special investigations using single-cylinder engines, either petrol or diesel. It will be possible to use radioactive tracer technique for cylinder wear measurement in this cell.

Axle Rig.—This new facility consists of a universal axle test rig to be used for the evaluation of hypoid E.P. additives. The rig is capable of undertaking high speed—low torque and low speed—high torque tests and also shock tests on automotive hypoid axles. It is driven by a Perkins L-4 diesel or alternatively by a modified Chevrolet engine through a Rootes 5-speed gearbox.

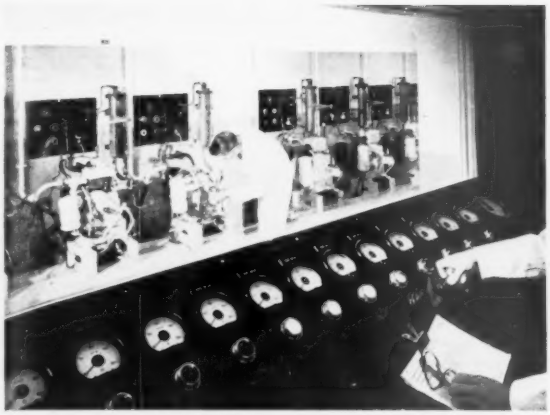
When used under high-torque conditions, the axle shafts drive two David Brown 20-1 speed increasing gearboxes, the output of which is coupled to and drives a Heenan and Froude DPX 3 hydraulic dynamometer. Under high-speed conditions the shafts drive the flywheel units, now disconnected from the gearboxes, and the drive is direct from the flywheel units by high-speed belting to the counter-shaft of the dynamometer.

The flywheel units are calculated to produce the same kinetic energy as a Standard Vanguard car at 70 mph. The units are adjustable within limits by removable half-ring weights.

A feature of this laboratory axle rig test is that it will



A general view of the Caterpillar test cell



The control panel of the Petter W.1 test cell with some of the engines seen through the observation window

enable track test conditions to be simulated in the laboratory. Thus, the high torque—low speed test is comparable with driving a fully-laden car in first gear at full throttle up a 1 in 4 hill for 60 hours. Previously, track tests at the MIRA track at Lindley, near Nuneaton, had resulted in the development of Monsanto's new gear oil additive "Montogear B".

Control Hall

All engine cells are arranged on either side of the main control hall which extends the full length of the building. All control panels in the hall are of standard Monsanto design and readily replaceable. The entrance from the workshops is also centrally placed on one side of the hall for easy and quick access to all engine cells.

Ancillary Equipment

Complete facilities are provided for servicing and preparing engines for test.

On one side of the engine and axle stripping and assembly shop all dirty engines are stripped and on the other side engines and axles are rebuilt. The associated facilities described below are located around this room.

The engine cleaning room contains all equipment for cleaning engine parts after use, including degreasing by trichloroethylene vapour, deposit removal by caustic soda or cresylic acid/detergent formulations, a kerosine washing bath, and a ventilated hood for brush washing with solvents.

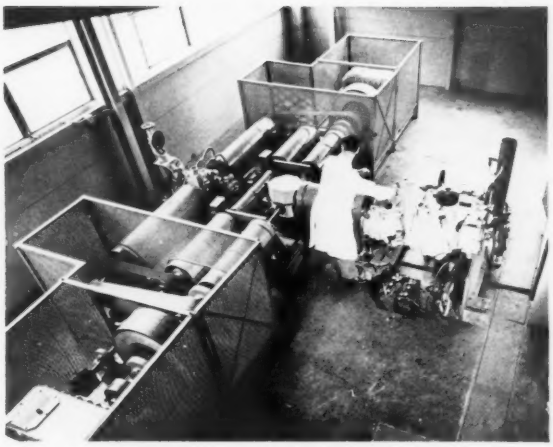
All grinding and similar operations are performed in one room to eliminate carborundum dust contamination of other sections. This room adjoins the engine cleaning room to ensure re-washing of parts after grinding-in.

New engine parts issued from stores are critically examined and measured in the parts preparation and measurement room to ensure their suitability for use in engines. A similar routine is followed on completion of a test in order to measure wear.

In the diesel injector maintenance room all injectors, magnetos, and carburettors are tested, maintained, and repaired.

Piston Rating

Piston ratings are assessed in one room which contains a cabinet containing standard pistons showing ratings from 0 to 10.



The axle test rig where hypoid gear additives are evaluated

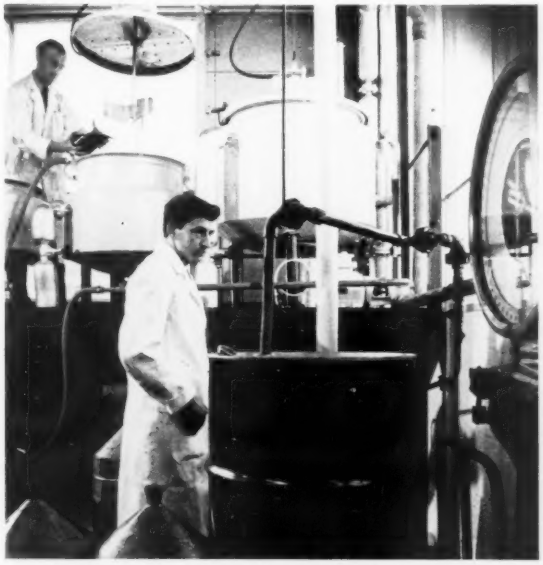
Chemical and Physical Tests

Fully-equipped laboratories are available for carrying out tests by IP, ASTM, and other methods on materials both before and after engine tests.

Oil Blending

For the preparation of oil and additive blends three steam-jacketted blending vessels of 10, 25, and 50 gallon capacity respectively are used. These are stirred by Bullows semi-rotary motors with scroll-type paddles. Oil can be weighed direct from the barrel on the scale and transferred to the vessel by electric pump.

If comparatively small blends are required for special tests, these can be made in the 2-gallon pails in which the samples are conveyed to the engine cells.



The blending plant where additive formulations are prepared

Personal Notes

V. C. Beaumont

To celebrate forty-five years of service to the Company, **V. C. Beaumont,** manager of Mobil's South Midland retail division, was recently honoured by a luncheon at which the host was **F. P. Barribal,** a director of the Company. Mr Beaumont was presented with a standard lamp and the Company's 45-year service emblem.

Throughout his career Mr Beaumont remained on the marketing side of the business and, after service in the army and the R.A.F. during the first world war, worked in Northern Ireland until 1927 when he became the Company's youngest salesman at that time, and was in charge of the Leicestershire territory. In 1933 he became district manager of the Midland automotive division and in 1956 was appointed manager of the newly formed South Midland retail division.

He has given special study to marketing problems associated with the motor trade, and has been a member of the Institute of the Motor Industry since 1935, being the first honorary secretary of the Coventry Centre at its formation in 1947, and subsequently chairman.

E. R. Blane

On 31 July, to mark the end of his service as consultant in the Technical Services Laboratory of Mobil's Coryton refinery, **E. R. Blane,** A.R.I.C., F.Inst.Pet., was presented with a motor garden mower and a tankard by J. C. Gridley, chairman of Mobil Oil Co.

During his service with Mobil Mr Blane has been responsible for much original work on process products, particularly on emulsions, tanners' products, and cutting and rolling oils. He joined the Company in 1934 as a salesman-chemist in the Tanners Department. In 1938 he moved to the Technical Department and eight years later was appointed technologist in the field services of the Department. In 1953 he was transferred to the Company's Central Laboratory.

D. I. Lawson, M.Sc., M.I.E.E., F.Inst.Pet., was made director of fire research of the Joint Fire Research Organization of DSIR on 1 August, in succession to **S. H. Clarke,** C.B.E., who has been appointed director of DSIR'S Warren Spring laboratory.

National Benzole Co. Ltd made the following appointments from 1 August: **D. T. Chadwick** as manager, Midland division; **T. F. Macfarlane,** formerly manager, consumer trade, as manager, retail marketing; and **D. Birrell,** previously assistant divisional manager, South Wales, as manager, consumer trade.

F. Gordon Kay

F. Gordon Kay, A.M.I.Mech.E., F.Inst.Pet., has been elected to the board of Acheson Colloids Ltd. Mr Kay, who has been with the Acheson group for thirty-four years, was formerly manager, sales relations of Acheson Industries (Europe) Ltd, the parent body for Acheson Colloids Ltd, Acheson Dispersed Pigments Co., and Acheson Colloiden N.V. of Holland. He has been responsible for advice on sales and sales policy to the various units of the group throughout Europe.

M. Mothio, A.M.Inst.Pet., has been appointed sales manager of the London division of Shell-Mex and B.P. Ltd, in succession to **C. S. Martin,** who is now manager of the north-western division.

Mr Mothio served with the Asiatic Petroleum Co. (now Shell Petroleum Co.) from 1934 to 1937. Two years later he joined Shell-Mex and B.P.'s statistical department and after service in the army was seconded to the Petroleum Board. He rejoined the Company in trade relations department in 1948.

Robert T. Bonn has been elected treasurer of Esso Export Corporation, an affiliate of Standard Oil Company (New Jersey) engaged in international supply and marketing operations of the Jersey group of companies.

Mr Bonn, a graduate of Columbia University and the Harvard Graduate School of Business, was formerly assistant treasurer of Esso Export. In his new post he succeeds **R. B. Stokke** who remains a director of the corporation.

G. W. M. Wiggins, formerly manager of Petrofina (Gt Britain) Ltd's South East Region, has been appointed manager of motor fuel department, head office. **N. R. Griffiths,** formerly manager of motor fuel department, has been appointed manager of South East Region.

P. J. Hyde has been appointed engineer commodore of BP Tanker Company's fleet from 1 July. Mr Hyde entered the service of the Company in 1931 as second engineer officer and was promoted chief engineer of m.v. *British Courage* in 1937. In 1957 he was appointed one of the Company's senior post chief engineers.

Mr Hyde, who is at present serving in m.v. *British Fame*, succeeds as engineer commodore **Charles Howard,** who has retired after 36 years' service.

John Duffus, whose address is now "Hilton", Tennyson Street, Leamington, Cambridge, New Zealand, writes that he extends a warm welcome to any member of the Institute who happens to be in New Zealand, and would like to call on him.

Twenty-year-old **David L. Smith,** of Tufnell Park, London, adjudged "Cadet of the Year 1957" in the Shell Tanker fleet, recently received a sextant from A. S. C. Hulton, managing director of Shell Tankers Ltd, at a ceremony in London.

This annual award is based both on the results of the Merchant Navy Training Board examinations and on the reports from the masters of the tankers in which the apprentice has been gaining practical experience.

David Smith was chosen from some 350 serving apprentices. In his first Merchant Navy Training Board examination he gained 95·6 per cent of the possible marks and was granted a certificate of merit by the Board and a prize by his Company. In his second-year examination he secured 95·8 per cent of the marks, and it is likely that he will be granted another certificate of merit.

W. A. Campbell, manager of Government relations and **W. E. Locher,** manager of operations, have been elected vice-presidents of the Trans-Arabian Pipe Line Co.

Mr Campbell joined Tapline in Beirut in 1947 after serving as president of the American Levant Shipping Co., also in Beirut. From 1934 to 1942 he was field director of the committee which excavated ancient Antioch and served as field archaeologist with the Institute for Advanced Study in Princeton, New Jersey.

Mr Locher, who has been with Tapline since 1950, has been associated with affiliated companies since 1934. Prior to his transfer to Tapline, he headed the pipeline division of the Creole Petroleum Corporation in Caracas, Venezuela. Mr Locher began his career as an electrical engineer for Lago Petroleum Corporation in Venezuela. He joined the Plantation Pipe Line Co. in Atlanta as electrical engineer in 1941 and later served as Plantation's division superintendent at Baton Rouge.

Dr Siro Vazquez has been appointed co-ordinator of the producing and co-ordination department of Standard Oil Co. (New Jersey), and will be responsible for co-ordinating the production activities of the Company's affiliates throughout the the world.

Dr Vazquez, who has been a director of Creole Petroleum Corporation, succeeds **M. A. Wright** who was elected to the board of Jersey Standard on 28 May. Before joining Creole in 1937 he had been for four years a petroleum inspector of the Venezuelan Government in the Quiriquire District. During his 21 years with the Company Dr Vazquez has been successively an assistant chief engineer, chief petroleum engineer, assistant production manager, and production manager. In 1953 he was elected to the Creole board.

W. J. Pearson has been appointed sales manager for the Continental range of butterfly valves being manufactured in England by Fisher Governor Co. Ltd (a member of the Elliott Automation Group).

W. E. J. Cross, formerly general manager, has been appointed managing director of Joseph Batson & Co. Ltd, Tipton.

Sir Philip and Lady Southwell outside Buckingham Palace after Sir Philip had received his accolade of knighthood from H.M. the Queen

G. M. Knebel has been appointed to the newly created post of senior exploration adviser of Standard Oil Company (New Jersey). He is succeeded as manager of the exploration division by **W. E. Wallis,** who is replaced as deputy manager by **V. C. Maley,** formerly regional geologist.

Mr Knebel, who joined the Jersey organization in 1924 as a geologist, served as a director, vice-president, and manager of the Standard Oil Company of Venezuela before becoming Jersey Standard's exploration manager in 1944.

Mr Wallis has been with Jersey Standard and its affiliates since 1930 and was exploration manager of Creole Petroleum Corporation from 1948 to 1954 when he was appointed deputy manager for exploration for Jersey Standard.

Mr Maley joined the Humble Oil & Refining Company as a geologist in 1927 and was transferred in 1956 to the parent company as regional geologist.

Libyan Student to Train in U.K.

Mahmoud Mestary, a Mobil employee in Libya recently arrived in Britain for a 3-month stay during which he will study Mobil's operations in the United Kingdom. He is believed to be the first Libyan student to come to the U.K. for training. In the illustration above, Mr Mestary is being welcomed by J. C. Gridley, chairman of Mobil Oil Co.

ANIC's Petrol-Chemical Factory at Ravenna

By MICHAEL KRAVTCHENKO

The large series of plants for the production of petroleum chemicals built recently by ANIC, about 2½ miles outside Ravenna, occupies an area of 524 acres. The project dates back to 1952 and originally contemplated a yearly output of only 30,000 tons of synthetic rubber. Subsequently this target was stepped up to 60,000 tons and, in view of the large quantities of nitrogen, hydrogen, and carbon oxide released by this production, nitrogen fertilizers are also manufactured. The maximum yearly output envisaged for the latter is 750,000 tons.

To maintain a factory of this size, the State-controlled company had to solve a number of big problems. Securing supplies of methane was an easy matter as extensive natural-gas beds exist in the neighbourhood and the whole problem was one of the construction of a direct pipeline.

Securing adequate supplies of water was a harder task, but it has been satisfactorily solved by installing a special pumping station to collect water from the Reno River at the rate of up to 4500 tons an hour. The water is conveyed to the factory by a ten-mile canal dug for the purpose.

Large quantities of chalk are also required for the fertilizer-producing department and, as suitable limestone quarries have been found not far from Ravenna, this material is brought in trucks.

The factory borders the Corsini Canal which connects to the sea and, thus, some of the materials needed are brought in ships. Large quantities of fertilizers are taken away by sea, most of them being intended for Southern Italy and for exports. At present, this Canal admits only small craft (up to 4000 tons), but is soon to be deepened sufficiently to take 15,000-ton ships.

The erection of ANIC's factory has required 7000 tons of pipes, 27,000 tons of machinery and boilers, 60,000 tons of Portland cement, 13,000 tons of iron rods, and 7500 tons of miscellaneous iron structures. Ten miles of roads had to be built, together with 23 miles of sewers and 15 miles of buried piping.

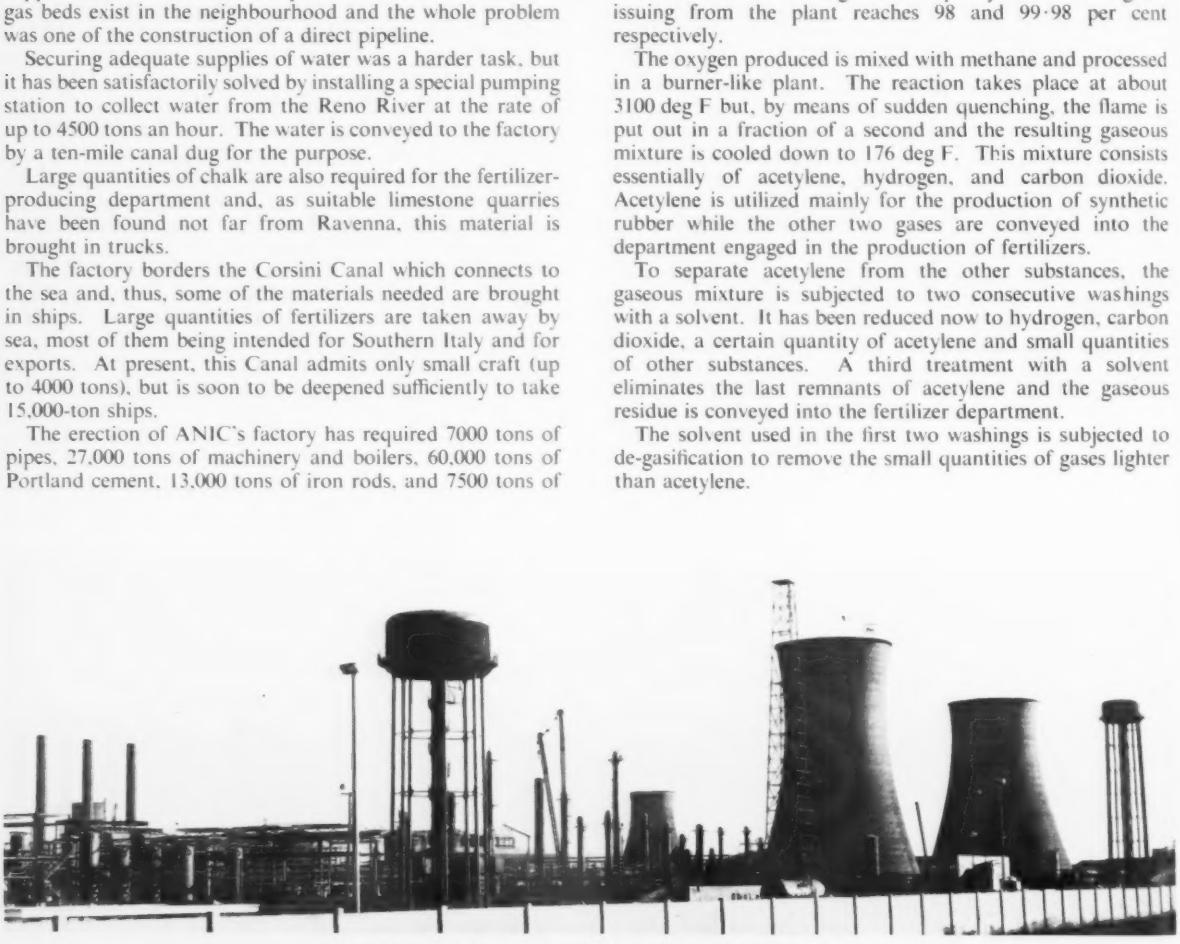
The Synthetic Rubber Process

To ensure its freedom from dust, air is taken from a considerable height, forced through filters into compressors driven by steam turbines and then into a low-pressure Linde plant where it is split into its essential components, oxygen and nitrogen. This plant is equipped with two cooling towers and two gasometers with the capacity of 10,000 cubic metres each. One of the gasometers is used for storage of oxygen and the other for nitrogen. The purity of the two gases issuing from the plant reaches 98 and 99·98 per cent respectively.

The oxygen produced is mixed with methane and processed in a burner-like plant. The reaction takes place at about 3100 deg F but, by means of sudden quenching, the flame is put out in a fraction of a second and the resulting gaseous mixture is cooled down to 176 deg F. This mixture consists essentially of acetylene, hydrogen, and carbon dioxide. Acetylene is utilized mainly for the production of synthetic rubber while the other two gases are conveyed into the department engaged in the production of fertilizers.

To separate acetylene from the other substances, the gaseous mixture is subjected to two consecutive washings with a solvent. It has been reduced now to hydrogen, carbon dioxide, a certain quantity of acetylene and small quantities of other substances. A third treatment with a solvent eliminates the last remnants of acetylene and the gaseous residue is conveyed into the fertilizer department.

The solvent used in the first two washings is subjected to de-gasification to remove the small quantities of gases lighter than acetylene.



A general view of the ANIC petroleum-chemical plant at Ravenna

Part of the co-polymerization plant at Ravenna

The solvent is now subjected to a second de-gasification to liberate acetylene. The heavier substances remain dissolved.

The acetylene obtained still contains some traces of solvent and these are removed by condensation at a very low temperature. The purified gas is now admitted into two cylinders made of rustless steel filled with water containing sulphate of mercury, sulphate of iron, and metallic mercury.

As acetylene is forced through this liquid, some of it turns into acetaldehyde while small quantities of by-products (crotonaldehyde, acetic acid, etc.) are also formed. The vapours issuing from the cylinders contain acetaldehyde, some retained acetylene, and by-products. They are treated with water which absorbs acetaldehyde (with small quantities of acetylene and by-products) and the resulting solution is stored in tanks.

To separate acetaldehyde from water, the solution is distilled. The acetaldehyde thus obtained is processed to remove crotonaldehyde, which it still contains, and then condensed and de-gasified to remove the last remnants of acetylene.

The purified acetaldehyde is subjected to a partial hydrogenation and turned into a mixture of unchanged acetaldehyde and ethyl alcohol. This mixture is turned into butadiene in accordance with the process that has been derived from that of Ostromislensky, who was the first to discover that if a mixture of alcohol and acetaldehyde is forced to pass over a catalyzer consisting of strongly heated kaolin, butadiene is formed.

The mixture obtained at this stage contains butadiene, some acetaldehyde, and alcohol that have not been absorbed by the reaction, and a considerable quantity of ethylene, butylene, ethyl ether, heavy hydrocarbons (butadiene oils), and other by-products.

The butadiene produced has to be distilled and rectified until it reaches the desired degree of purity. During this processing, some of the particularly useful by-products are recovered.

The patents covering the partial hydrogenation of acetaldehyde and the production of butadiene have been purchased from Union Carbide Corporation. That covering styrol production has been purchased from Koppers Company.

The production of styrol is carried out in two stages. First, ethylbenzol is obtained from ethylene and benzol by reacting them in the presence of aluminium chloride and ethyl chloride at 203 deg F. Unfortunately, this reaction generates also polyethylbenzol. To reduce the quantity of this unwanted substance, extra quantities of benzol are used and some of the polyethylbenzol is re-processed. The benzol used in this process has to be dehydrated by means of azeotropic distillation.

The ethylbenzol obtained is cooled, separated from mercuric chloride and hydrocarbons, and washed with a solution of caustic soda. It is then distilled to eliminate benzol and washed again with a soda solution.

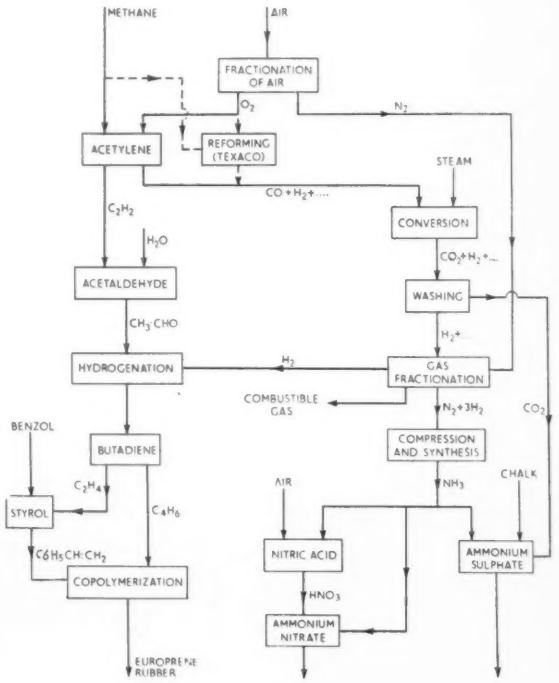
The preparation of styrol from ethylbenzol is carried out by means of a strongly endothermic reaction. The necessary heat is supplied by steam at about 1300 deg F. This steam plays the role of a diluent and also reacts with deposits on the catalyst. The stream of steam and ethylbenzol is forced through a catalysis plant in which a temperature of over 1000 deg F is maintained.

The resulting styrol is accompanied by benzol, toluol, ethylbenzol, etc, and these have to be removed by distillation at a reduced pressure. During this process, polymerization is prevented by means of special inhibitors.

To obtain synthetic rubber of BRS type, butadiene has to be copolymerized with styrol. The lower the temperature at which this operation is carried out the better is the quality of the rubber produced. However, copolymerization at low temperature requires longer time, and to obviate this difficulty special catalyzers are used.

Polymerization takes place in a double-walled low-temperature reactor filled with a watery emulsion stabilized with soap. An automatic refrigeration plant is used to keep down the temperature of the reaction and to pre-cool the reagents.

Before its admission into the reactor, butadiene is washed with a weak solution of caustic soda to free it from the inhibitor it contains.



Flow chart of operations at Ravenna

A finished 44-lb block of synthetic rubber

The catalyst used consists of an initiator and a complex mixture serving as an activator. In order to modify the polymer chain, mercaptan compounds are added to the reaction mixture. The progress of the reaction is checked up from time to time by means of measurements of viscosity. When the reaction is completed, the resulting latex is passed into an atmospheric-flashing tank. Here the remains of butadiene still present are removed and transferred into a special device which recovers the small quantities of styrol carried along with the gas.

The latex is now transferred into a reduced-pressure tank (200 mm Hg) where it is freed of the last traces of butadiene and then into another plant where the few remaining traces of styrol are eliminated by means of a jet of steam.

After that, anti-oxidizing substances are added and then the latex is processed with salts and acids to eliminate the remnants of emulsion still present in it. In this manner, the suspension is induced to lose its stability and the copolymer coagulates into a porous mass.

After a few more cleansing operations, this mass is disintegrated, dried, and finally pressed into rectangular cakes. It only remains to dust these cakes with talcum powder and to wrap them up in plastic film and paper.

The process used in the production of this rubber or *Europrene* as it has been named, has been ceded to ANIC by Phillips Petroleum Company of Bartlesville (U.S.A.).

Fertilizer Production

The processing carried out at ANIC's factory releases large quantities of hydrogen, nitrogen, and carbon oxide, and in order to make the whole concern economically possible, a department producing nitrogen fertilizers has been added.

At present, ANIC produce only sulphate of ammonia and ammonium nitrate, but later other types of nitrogen fertilizers will be produced also if the market situation justifies it.

To obtain the ammonia, a mixture of hydrogen and carbon oxide is treated with steam and then decarbonized by means of washing with water and soda. Next it is passed through a gas-fractioning Linde plant. Here, after the processing, the gas is washed with liquid nitrogen to remove the residues of carbon oxide, and then further quantities of nitrogen are added in order to make the mixture more suitable for the production of ammonia.

The mixture of hydrogen and nitrogen is next compressed at 400 or 500 atmospheres and admitted into a Casale plant which turns it into liquid anhydrous ammonia.

A part of this ammonia is turned into nitric acid by oxidation under pressure. By direct reaction with ammonia, the nitric acid is transformed into ammonium nitrate which is then mixed with chalk. A separate plant is used for the production of ammonia sulphate. The process used here consists essentially of a double decomposition between calcium sulphate (contained in chalk) and carbonate of ammonia obtained by means of carbonation of ammonia solutions.

There has been much speculation in Italy concerning the advisability of investing such a large amount of money (60 milliard lire or over £34 million) in a factory of this size.

There seems to be no apprehension concerning the marketing of the rubber produced, as Italy consumes artificial rubber at a rate of 15,000 tons a year and this figure is likely to increase when such rubber is home-produced. Furthermore, in all probability, some of the natural rubber consumed in the country will be replaced now by a synthetic type.

The situation appears to be different as regards nitrogen fertilizers. The Ravenna factory is not the only one that produces nitrogen fertilizers in Italy and, thus, when it is fully on stream, Italian farmers will have at their disposal about twice as much of such fertilizers as is their normal requirement.

The Directors of ANIC point out that as, at present, the consumption of nitrogen fertilizers in Italy is very low, it will not be difficult to expand it by the right price policy. In fact, in Italy, nitrogen fertilizers are used only to the extent of about 15 kg per hectare while in the Netherlands this total reaches almost 80 kg, in Belgium over 50 kg, and in West Germany, 35 kg.

There have already been cuts in prices which have aroused a great interest of the farmers all over Italy.

Storage for finished nitrogen fertilizers

World Tanker Statistics Second Quarter 1958

Fewer oil tankers were under construction in the world during the second quarter of 1958 than in the first quarter but they represented an increase of 1·7 per cent in the total tonnage under construction. The 359 ships accounted for 51·9 per cent of vessels building and their gross tonnage of 5,257,975 tons was 205,173 tons above the figure for the first quarter of this year, states *Lloyd's Register Shipbuilding Returns* for the Second Quarter of 1958.

The ratio of steam to motor propulsion changed slightly in favour of steam in the second quarter. There were 166 steam tankers under construction and 193 motor ships, their respective gross tonnages being 3,689,723 and 1,568,252

TABLE I

REGISTRATION OF OIL TANKERS UNDER CONSTRUCTION AT END-JUNE 1958

Country of registration	*No.*	*Gross tonnage*	*Country of build*	*No.*	*Gross tonnage*
Britain ...	78	1,191,360	Britain ...	62	933,140
			Belgium ...	1	21,000
			France ...	1	22,000
			Germany ...	3	25,250
			Italy	7	163,000
			Netherlands ...	1	500
			Sweden ...	1	25,000
			Unspecified ...	2	1,470
Canada ...	4	32,100	Commonwealth	3	30,300
			Netherlands ...	1	1,800
Belgium ...	6	60,328	Britain ...	2	24,000
			Belgium ...	1	13,066
			France ...	1	21,400
			Germany ...	2	1,862
Brazil	3	47,000	Germany ...	1	5,000
			Netherlands ...	2	42,000
Denmark ...	11	174,500	Britain ...	2	42,000
			Denmark ...	6	93,900
			Italy	1	12,800
			Japan ...	2	25,800
Finland ...	3	14,550	Germany ...	1	900
			Netherlands ...	2	13,650
France ...	12	256,140	Denmark ...	2	36,600
			France ...	10	219,540
Germany ...	29	97,262	Germany ...	29	97,262
Greece ...	1	18,500	Belgium ...	1	18,500
Iran	1	21,000	Netherlands ...	1	21,000
Irish Republic	1	12,000	Britain ...	1	12,000
Italy	17	272,118	Italy	17	272,118
Japan	21	123,335	Japan ...	21	123,335
Liberia ...	35	833,831	Germany ...	5	92,263
			Japan ...	15	413,618
			Netherlands ...	6	92,500
			Sweden ...	2	41,150
			U.S.A. ...	7	194,300
Netherlands ...	17	147,731	Germany ...	7	7,700
			Japan ...	1	20,700
			Netherlands ...	9	119,331
Norway ...	37	558,395	Britain ...	4	55,100
			Denmark ...	2	24,500
			France ...	1	13,200
			Germany ...	7	137,900
			Netherlands ...	4	60,500
			Norway ...	15	198,530
			Sweden ...	4	68,665
Panama ...	17	405,640	Britain ...	1	18,750
			Italy	6	130,000
			Japan ...	6	146,640
			Sweden ...	1	26,450
			U.S.A. ...	3	83,800
Peru	1	4,297	Unspecified ...	1	4,297
Poland ...	2	25,500	Poland ...	1	12,000
			Yugoslavia ...	1	13,500
Portugal ...	2	33,400	Belgium ...	1	17,400
			Unspecified ...	1	16,000
Russia (U.S.S.R.) ...	5	16,650	Finland ...	5	16,650
Spain ...	11	120,705	Spain ...	11	120,705
Sweden ...	14	225,925	France ...	1	22,000
			Italy	1	12,700
			Sweden ...	11	179,225
			Unspecified ...	1	12,000
Switzerland ...	3	3,058	Germany ...	3	3,058
U.S.A. ...	19	393,250	Japan ...	1	27,400
			Sweden ...	1	40,000
			U.S.A. ...	17	325,850
Yugoslavia ...	2	15,400	Yugoslavia ...	2	15,400
Unspecified ...	7	154,000	Britain ...	2	25,000
			Belgium ...	1	12,000
			Germany ...	1	10,500
			U.S.A. ...	3	106,500

Of the 359 oil tankers under construction, totalling 5,257,975 gross tons, 217, of 2,773,999 gross tons, are for registration in country of build.

In Britain at the end of June 74 tankers, of 1,109,990 gross tons, were under construction. This is 40,752 tons greater than in the previous quarter and represents 48·4 per cent of total tonnage under construction in the United Kingdom.

Britain leads as country of registration of tankers under construction with 78 vessels of 1,191,360 gross tons. Second place is taken by Liberia with 35 ships of 833,831 gross tons; third is Norway with 37 ships of 558,395 gross tons; and fourth is Panama with 17 of 405,640 gross tons. Full details are given in Table I.

Germany again takes second place to Britain in number and tonnage of tankers building with 59 ships of 381,695 gross tons. As in the previous quarter, however, tonnage building in Japan, at 757,493 gross tons, far exceeds that in Germany but the number of vessels is 33 fewer. Italy, with 32 tankers building of 590,618 gross tons, also shows an increase on the first quarter figures. Table II lists tankers under construction, with their country of build and type of propelling machinery.

During the second quarter Britain commenced 13 tankers, launched 9, and completed 15. Japan commenced 33, launched 38, and completed 39. Germany commenced 23, launched 25, and completed 19. The United States commenced 6, launched 7, and completed 4. Details of launchings appear in Table III.

TABLE II

OIL TANKERS UNDER CONSTRUCTION AT END-JUNE 1958

Country of build	*Steam*		*Motor*		*Total*	
	No.	*Gross tons*	*No.*	*Gross tons*	*No.*	*Gross tons*
Britain & Northern Ireland	41	834,792	33	275,198	74	1,109,990
British Commonwealth	1	24,000	2	6,300	3	30,300
Belgium ...	3	56,900	2	25,066	5	81,966
Denmark ...	—	—	10	155,000	10	155,000
Finland ...	—	—	5	16,650	5	16,650
France ...	9	198,540	5	99,600	14	298,140
Germany ...	14	289,813	45	91,882	59	381,695
Italy	24	517,700	8	72,918	32	590,618
Japan ...	25	662,658	21	94,835	46	757,493
Netherlands ...	12	222,780	14	128,501	26	351,281
Norway ...	2	33,640	13	164,890	15	198,530
Peru	—	—	1	4,297	1	4,297
Poland ...	—	—	1	12,000	1	12,000
Portugal ...	—	—	4	29,470	4	29,470
Spain	1	22,000	10	98,705	11	120,705
Sweden ...	4	116,450	16	264,040	20	380,490
U.S.A. ...	30	710,450	—	—	30	710,450
Yugoslavia ...	—	—	3	28,900	3	28,900
World total ...	166	3,689,723	193	1,568,252	359	5,257,975

TABLE III

OIL TANKERS LAUNCHED DURING THE SECOND QUARTER OF 1958

Country of build	*Steam*		*Motor*		*Total*	
	No.	*Gross tons*	*No.*	*Gross tons*	*No.*	*Gross tons*
Britain & Northern Ireland	4	77,668	5	25,859	9	103,527
British Commonwealth	—	—	1	4,300	1	4,300
Belgium ...	—	—	1	13,066	1	13,066
Denmark ...	—	—	2	30,800	2	30,800
Finland ...	—	—	1	3,330	1	3,330
France ...	2	49,630	1	9,400	3	59,030
Germany ...	4	67,400	21	30,010	25	97,410
Italy	5	114,100	1	12,700	6	126,800
Japan ...	11	281,808	27	36,135	38	317,943
Netherlands ...	3	45,680	2	12,500	5	58,180
Norway ...	—	—	3	34,410	3	34,410
Spain ...	—	—	2	25,800	2	25,800
Sweden ...	1	25,000	8	138,075	9	163,075
U.S.A. ...	7	149,550	—	—	7	149,550
Yugoslavia ...	—	—	1	13,500	1	13,500
World total	37	810,836	76	389,885	113	1,200,721

U.K. Oil Imports Increase in First Half of 1958

Compared with the first six months of 1957, imports of oil into the United Kingdom during the first half of 1958 showed a total increase of 649,774 thousand gallons. The proportion of crude imported rose by some 4 per cent to account for three-quarters of the total imports. There was a substantial drop in imports of kerosine and a smaller fall in lubricating oil imports. Motor-spirit imports, in a period when all restrictions on sales and consumption had been removed, showed an increase in total volume, but represented a slight decline in the percentage of imports. Total fuel oil imports rose by over 150 million gallons but were compensated by decreases of about 20 million gallons in the imports of gas oil and of 30 million gallons for diesel oil, giving a net increase of about 104 million gallons for the group's total.

The most spectacular change in the pattern of supply was in imports from the U.S.A. These plummeted from the nearly 20 per cent attained in 1957 to less than 2 per cent.

The steady growth of production in the Middle East is reflected in a gain of rather more than 15 per cent in the share of total imports to Britain during the period under consideration. More than half the U.K's imports from the Middle East emanated from Kuwait. A seven-fold increase in percentage is also recorded for Iraq and there was a considerable rise in supplies from Iran.

The Caribbean and South American area, which supplied just over one-fifth of U.K imports, showed no radical change of pattern. Total supplies were slightly greater than in 1957 but Venezuela's share was less.

Imports from Europe more than doubled and a large proportion of this increase was supplied by the Netherlands.

Full details are given in the accompanying table.

Imports of Petroleum into the United Kingdom

January to June, 1958

(in thousand gallons)

	Crude petroleum	*Motor spirit*	*Kerosine*	*Gas, diesel, and fuel oils*	*Lubricating oil*	*Total*	*Percentage of total*	*January to June 1957*	
								Total	*Percentage*
MIDDLE EAST									
Kuwait	2,088,168	—	—	—	—	2,088,168	38·7	1,772,876	37·4
Iraq	496,957	—	—	—	—	496,957	9·2	64,374	1·3
Iran	404,565	—	—	—	—	404,565	7·5	197,508	4·2
Saudi Arabia	142,848	—	—	13,853	—	156,701	2·9	15,103	0·3
Bahrain, Qatar, and Trucial States	105,149	56,846	11,347	39,016	—	212,358	4·0	145,345	3·1
Aden	—	26,059	1,470	—	—	27,529	0·5	59,594	1·2
	3,237,687	82,095	12,817	52,869	—	3,386,278	62·8	2,254,800	47·5
CARIBBEAN & SOUTH AMERICA									
Venezuela	613,109	—	12,448	79,121	8,129	712,807	13·2	714,419	15·1
Netherlands Antilles ...	61,001	39,943	53,109	55,810	10,842	220,705	4·1	221,563	4·7
Colombia	20,798	—	—	—	—	20,798	0·4	52,208	1·1
Peru	16,451	—	—	—	—	16,451	0·3	15,135	0·3
Trinidad	—	66,206	21,945	73,301	—	161,452	3·0	196,208	4·1
	711,359	106,149	87,502	208,232	18,971	1,132,213	21·0	1,199,533	25·3
UNITED STATES	6,861	18,552	1,077	52,014	18,130	96,634	1·8	916,026	19·3
EUROPE									
Netherlands	30,387	41,472	36,273	242,199	3,746	354,077	6·6	194,800	4·1
France	—	9,528	1	51,834	1,720	63,083	1·2	17,202	0·4
Italy	—	6,381	—	50,091	—	56,472	1·0	7,383	0·2
West Germany	—	—	—	2,921	—	2,921	0·1	33	—
Soviet Union	—	—	—	—	1,981	1,981	—	2,874	—
	30,387	57,381	36,274	347,045	7,447	478,534	8·9	222,292	4·7
FAR EAST									
Sarawak	47,103	—	—	—	—	47,103	0·9	—	—
OTHER COUNTRIES ...									
British Commonwealth ...	7,712	1,750	37	37,272	175	46,946	0·9	29,716	0·6
Foreign	7,313	68,017	1,015	106,173	705	183,223	3·4	71,261	1·5
	15,025	69,767	1,052	143,445	880	230,169	4·3	100,977	2·1
GRAND TOTAL	4,048,422[a]	334,754	138,722	803,605[b]	45,428	5,390,307[d]	100·0	4,740,533[e]	100·0
PERCENTAGE OF TOTAL	75·1	6·2	2·6	15·0	0·8	100·0	—	—	—
GRAND TOTAL, Jan.–June 1957	3,391,171	331,841	216,103	699,751[c]	54,762	4,740,533[e]	—	—	—
Percentage of total	71·5	7·0	4·6	14·7	1·2	100·0	—	—	—

a Of this total 117,969,000 gallons was refinery feed.

b Made up of gas oil, 269,859,000 gallons; diesel oil, 5,419,000 gallons; fuel oil, 528,327,000 gallons.

c Made up of gas oil, 289,797,000 gallons; diesel oil, 35,452,000 gallons; fuel oil, 374,502,000 gallons.

d Including 19,376,000 gallons "other spirit" not included elsewhere.

e Including 46,905,000 gallons "other spirit" not included elsewhere.

Exhibitions and Conferences

Polytechnic Courses in Management and Administration

During the autumn term the Department of Management Studies of the Polytechnic, Regent Street, London, W.1, is offering a number of courses of interest to business executives. Most of the lectures are held once a week in the morning or afternoon, but there are some evening courses. Brief details are given below.

Course	Duration	Starting date	Time
Communication in Management			
Chairmanship and Committee Procedure	9 weeks	22 September	2-5 p.m.
Report Writing	12 weeks	25 September	9.30 a.m.–12.30 p.m.
Effective Speaking	10 weeks	10 October	9.30 a.m.–12.30 p.m.
Communication in Management	12 weeks	23 September	6-8 p.m.
Work Study and Office Management			
Work Study	12 weeks	22 September	Whole day
Work Study for Apprentices	12 weeks	24 September	Whole day
Work Study Appreciation	11 weeks	29 September	9.30 a.m.–12.30 p.m.
Work Simplification in the Office	18 fortnightly	1 October	9.30 a.m.–12.30 p.m.
Office Supervisors	2 courses	1 and 2 October	9.30 a.m.–12.30 p.m.
Management Problems of Publishing and Bookselling	10 weeks	2 October	2-5 p.m.
Organization and Method	14 weeks	8 October	6-8 p.m.
Production Control and Planning	28 evenings	26 September	6-9 p.m.
Economics, Finance, and Accounting			
Financial Background for Policy Making	12 weeks	24 September	2-5 p.m.
Commercial and Industrial Forecasting	11 weeks	30 September	2-5 p.m.
Management Accounting	15 weeks	8 October	2-5 p.m.
Presentation of Accounting Information	5 weeks	9 October	2-5 p.m.
Restrictive Trade Practices	8 weeks	20 October	2-5 p.m.
The European Common Market	8 weeks	23 October	2-5 p.m.
Management Control through Accounting	14 weeks	9 October	6-8 p.m.
Human Relations			
Psychological Factors in Personnel Management	10 weeks	2 October	2-5 p.m.
The Supervisor and his Problems	11 weeks	7 October	2-5 p.m.
Modern Incentive Schemes	12 weeks	15 October	2-5 p.m.
The Social Skills of Management	6 weeks	10 November	Whole day
Seminar in Personnel Management	3 terms	24 September	7.30-9 p.m.

Details and registration forms can be obtained from the Registrar, the Polytechnic, Department of Management Studies, St Katherine's House, 194 Albany Street, London, N.W.1.

BIM Elbourne Memorial Lecture

The fourth Elbourne Memorial Lecture will be delivered by the Earl of Verulam, J.P., chairman of the British Institute of Management, on 3 October at 8 p.m. at the Royal Commonwealth Society. His subject will be "The Great To-morrow".

The lecture was inaugurated in 1955 by the Institute of Industrial Administration, which was integrated with the BIM in 1957, in memory of the founder of IIA, Edward T. Elbourne.

Tickets for the lecture can be obtained free from British Institute of Management, 80 Fetter Lane, London, E.C.4.

Course on Automation of Chemical Plants

In a recent joint statement, Robert L. Logan, chairman, the Western New York Section, American Institute of Chemical Engineers, and Albert H. Gibney, chairman, Western New York Section of the Instrument Society of America, announced an evening course in Process Control Engineering at Tonawanda High School, New York, starting on 29 September.

New Books

The History of Whessoe

At first sight there seems to be no connexion between the small-scale retailing of ironware and glass and the supply and erection of the reactor vessels for the Calder Hall nuclear power station. Yet there is a link, tenuous perhaps, but clearly traceable through more than a century and a half—a link that goes back to the Darlington shop of William Kitching and forwards to the present-day firm of Whessoe Ltd.

The evolution of the Company since the opening of that little shop in 1790 is outlined in *The History of Whessoe*, which has recently been published. Five stages of development are described. The first extends for some 40 years and ends with the establishment of the Railway Foundry in 1830. The second, which is largely concerned with manufacture of locomotives and railway rolling stock, continued until 1862. During this period the foundry, the third owned by the Kitching family, became known as the Whessoe foundry. The next period, up to 1891, saw a change to the structural side of railway engineering since the railways themselves were now largely building their own rolling stock. Many varieties and sizes of steam cranes and weighbridges were added to the Company's products and there was a steady demand for wrought and cast-iron tanks and blast-furnace plant. The fourth period, which continued up to 1921, foreshadowed the modern Whessoe for the business became a private company and Whessoe turned away from general structural work to gasholders (the first big order was for a 3 million cu. ft holder for Gateshead) and tanks for the infant oil industry. By 1902 Whessoe had produced tanks as large as 110 ft in diameter and the capacity of the tanks produced annually had reached 50 million gal. During the first world war process plant for the chemical industry was supplied in the form of shop-built vessels. In the inter-war period, a licence was acquired from the Chicago Bridge and Iron Co. to manufacture Horton floating roofs and a department was set up to develop gas and chemical engineering. During the second world war at one stage Whessoe was adding every week 2 million gal capacity to the underground storage tanks of the Allies.

In the current period, since the war, Whessoe has rebuilt works and offices and has assisted in the development of the oil industry. For instance the cat-crackers at Stanlow were built by the Company. Three wind tunnels were erected at Bedford for the Royal Aircraft Establishment and the Company's contributions to the gas and chemical industries continue unabated.

The History of Whessoe is attractively produced and contains some clear and interesting drawings of early products of the Company in addition to photographs of more modern equipment both in Britain and overseas.

New DECHEMA Publications

Two new DECHEMA publications are *Annual Report for* 1956 *of the European Federation of Corrosion and its Member Societies* and *Annual Report for* 1956 *of the European Federation of Chemical Engineering and its Member Societies.*

Each report is divided into three sections, dealing respectively with the work and development of each Federation, the activities of the Member Societies, and research work in Europe.

Copies of either report, price DM 16 (postage extra), may be obtained from DECHEMA, Frankfurt (Main) 7, Postfach.

Survey of the European Common Market Area

Under the title *The New Europe*, the *Financial Times* has recently published an illustrated 72-page survey of market opportunities and national production and requirements in Belgium, France, Western Germany, Italy, Luxembourg, and the Netherlands, the six countries that constitute the new Common Market area in Europe. Some 30 articles examine this great contemporary experiment in commercial integration from the signing of the treaty of Rome in 1956, which inaugurated the European Economic Community, to the scope it provides for wider trading between the nations concerned and its effect on Britain. The prospects for sales of consumer and producer goods, the problems of labour supply, the production of energy, and the benefits of a common policy for transport are considered.

The opening article is on the Brussels International Exhibition which, with its expressed theme of a "Balance-sheet for a more human world", is seen as an example of the growing spirit of co-operation and understanding in Western Europe. Britain's part at Brussels forms the subject of a separate article by Sir John Balfour who asserts that the exhibition offers unique opportunities for British industry.

The rapid expansion of the petroleum chemicals industry in the area is outlined in an article by N. G. W. Luitsz, of the Shell Petroleum Co. Ltd. He mentions that the combined output of Western Germany, France, Italy, and the Netherlands in production of petroleum chemicals rose from some 150,000 tons in 1952 to just over 1 million tons in 1957.

Capital investment in the petroleum chemicals industry has also shown substantial increase. In the Common Market area in 1956 it had reached £85 million compared with £60 million in Britain and £1600 million in U.S.A. In West Germany alone some £45 million has been invested in the industry during the 10 years 1946–56; in France by the end of 1956 investment was £18 million, but this is expected to show a spectacular rise to over £100 million by the end of 1959. In Italy where natural gas is extensively used to make ammonia, methyl alcohol, and acetylene investment in the industry by 1956 had reached £18 million, but this was expected to increase three-fold by the end of next year. Similar trends in investment, though on a smaller scale, are apparent in Belgium and Holland. The Common Market would give member countries access to a much larger consuming area, with its attendant economic advantages.

There are no reasons to expect great changes in the oil industry in the area within the foreseeable future states a Special Correspondent of the *Financial Times* in sn article on the petroleum trade. Consumption is estimated to rise by 40 million tons of all products in 1962 compared with the figure for 1957. The largest increase predicted is of fuel oil, which is estimated to rise from a consumption of 28 million tons in 1957 to 49 million tons in 1962.

In the area Western Germany is the largest producer of indigenous crude and can satisfy about 30 per cent of her current requirements, but in general the pattern of the oil industry in the area is imported crude and domestic refining. In 1956 more than 85 per cent of petroleum products were refined in the area, and refining capacity which at the end of 1957 was put at 92 million tons is estimated to reach 160 million tons in 1962. Transport remains the dominant factor in assessing future trends in the industry. The greatest immediate changes would probably result from the completion of the projected Mediterranean-North Sea pipeline.

Petroleum Sourcebook 1958

A new 188-page bibliography of literature of interest to oilmen has recently been published under the title *Petroleum Sourcebook* 1958. The bibliography has been compiled from 1000 pages of literature references issued in 1957 by National Petroleum Bibliography and it lists some 4000 information sources covering 82 countries and 82 states, provinces, and geographic regions. More than 500 special publications are classified as well as the regional material from nearly 100 trade magazines and journals.

Copies, price $6.0 each, may be obtained from National Petroleum Bibliography, Box 3586, Amarillo, Texas, U.S.A.

Register of the Gas Industry 1958

The 1958 *Register of the Gas Industry* provides a comprehensive guide not only to officials in the gas-supplying industry in Britain, Canada, Australia, New Zealand, South Africa, and Malta, but also gives a short technical survey of recent developments.

About half of the volume is devoted to the directory section, which lists the names and positions of officers of the regional Gas Boards, the Gas Council, and the Ministry of Power. Names of the secretaries and addresses of other associations connected with the industry are also included.

The second half of the book, under the title Technical Section, is divided into three parts which deal respectively with production, distribution, and utilization. The part concerned with production discusses carbonization, refractories, oil-gasification processes, chemical and by-products plant, boiler feed-water treatment, and gasworks testing. Distribution is covered fully by chapters on gasholders, gas meters, and distribution data is tabulated. The final part surveys cooking appliances, space and water heating, refrigeration, and industrial and commercial heating. A buyer's guide to products required by the industry and its ancillaries concludes the volume.

Register of the Gas Industry is a *Gas Times* publication and copies may be obtained from Arrow Press Ltd, 1 Stamford Street, London, S.E. 1.

Opportunities for Qualified Men

Compact but comprehensive is a new 112-page reference book of opportunities for qualified men (and women) offered by nearly a hundred industrial and commercial organizations and government departments. Among the firms listed in the reference section are many prominent in the oil, chemicals, and allied industries.

The new volume, *The Directory of Opportunities for Qualified Men,* is a companion volume to directories of opportunities for graduates and school leavers, which were reviewed on p. 103 of the March issue of the IP REVIEW. This latest directory, which has a preface by Sir Miles Thomas, D.F.C., chairman of Monsanto Chemicals Ltd, is divided into two sections. The editorial section is composed of five articles together with a list of short full-time courses and lectures for qualified personnel. The reference section includes a map, a classified index of companies and qualifications required, and a list of opportunities from firms operating in the Commonwealth. A classified index and also a qualifications index is provided.

The Directory of Opportunities for Qualified Men is published by Cornmarket Press Ltd, 1 Lower James Street, London, W.1, and copies are available on application to that organization.

Trade Literature, etc.

New Factory for Cameron Iron Works

Cameron Iron Works Inc., Houston, Texas, recently opened another factory in the United States. The new 15,000-sq. ft plant, warehouse, and office building, which is in addition to the Company's three other factories at Leeds, England, Edmonton, Canada, and Patterson, Louisiana, is located at Odessa, Texas.

At the opening several new products were demonstrated, amongst which was a new lightweight small high-pressure blowout preventer, known as the type F. It is claimed to be the first preventer for working pressures up to 15,000 psi and it is based on new design principles and operating concepts.

The new preventer has stainless-steel rams, shafts packed at both ends, and very small fluid requirements for the operating mechanism. For example only ½ gallon is required to close the 7-inch valve. The size of piping to connect to the preventer may be reduced, and hoses may be utilized. The operating mechanism may be removed and overhauled without disturbing the drilling hookup and a single locking screw permits manual closure and locking of the valve by one hand wheel.

The new gate valve, also demonstrated, can operate at pressures up to 15,000 psi and incorporates a new principle of rotating the sealing surfaces each time the valve is opened. This distributes wear on these surfaces and improves the life of the valve.

The Audco Annin Valve

The Audley Engineering Co. Ltd, Newport, has concluded an agreement with the Annin Co., Los Angeles, U.S.A., to produce the Annin Domotor control valve in the U.K., where it will be known as the Audco Annin valve.

The valve, which has been in production in America for 10 years, is available in ASA ratings of 150, 300, 600, 900, and 1500 lb.

Shell-Mex and B.P. and Maidstone By-pass

Shell-Mex and B.P. are to supply the whole of the fuel and lubricants required in the construction of the first five-mile stage of the new Maidstone By-Pass.

The new highway will run from the Chatham Road north of Maidstone to Eyhorne Street. The £1½ million contract will be carried out by Richard Costain Ltd.

Shell-Mex and B.P. Ltd have set up a similar fuelling operation to that which they now have in action on the new London-Birmingham motorway. When work is at its peak the Company will be delivering about 5000 gpd of gas oil and other fuel to the constructional plant.

Crankcase Monitoring Unit

Designed to detect and give warning of explosive conditions in the crankcases of diesel engines, the Kidde monitoring unit has been approved by the Ministry of Transport and Civil Aviation for use in British passenger ships.

An important feature of this approval is where the unit is fitted the area of crankcase relief valves may be reduced by one half.

The unit also provides indication of overheating and is notable for its simplicity of design and high sensitivity.

The monitoring unit is manufactured by The Walter Kidde Co. Ltd, Northolt, Middlesex.

Anodically Protected Titanium

Recent discoveries by ICI Metals Division show that by utilizing properties unique to titanium, its range of applications can be further extended. Titanium can now be considered as a material of construction for use with hot strong sulphuric, phosphoric, hydrochloric, oxalic, and formic acids.

Further details of its potentialities can be obtained from Imperial Chemical Industries Ltd, London, S.W.1.

New Range of Balanced Opposed Compressors

A new range of heavy duty air-compressors of balanced opposed design is now marketed by the Consolidated Pneumatic Tool Co., 232 Dawes Road, London, S.W.6.

Outputs available range from 5000 cu. ft/min at low pressures to smaller outputs but at pressures up to 3000 psi.

Advantages claimed for the new range are high efficiency, small floor area and foundations required, easy accessibility, and reduction of vibration to a minimum by dynamic balancing.

Lubrication Chart for Humber Hawk

The latest two-colour lubrication chart in the Castrol range covers the new Humber Hawk. Copies are obtainable free from the Castrol Chart Library, C. C. Wakefield & Co. Ltd, 46 Grosvenor Street, London, W.1.

American Fired Heaters to be Made in Britain

Newton Chambers & Co. Ltd, Thorncliffe, have entered into a licence agreement with Struthers Wells Corporation, Warren, Pennsylvania, for the manufacture and sale in the United Kingdom of Struthers Wells equipment designed for a wide range of industrial heating at high temperatures.

The equipment now available comprises a complete range of fired heaters for circulating heating systems of the Dowtherm type in addition to those for the direct heating of process materials.

Some Applications of Scaffolding in Refineries

When Mills Scaffold Co. Ltd secured the contract for the supply and erection of equipment at Esso's Fawley refinery, the undertaking ranked as one of the largest in Southern England. Now, four years later, the Company is still on site, with its own depot, tube store, lorries, and a team of erectors specially trained in refinery work.

Scaffolding is regularly erected during inspection and overhaul of plant. When the catalytic cracker is shut down for its annual overhaul the scaffolding requires 18,000 ft of tube, 55,000 steel fittings, and 12,000 scaffold boards!

New Remote Level Controller

J. Edward Hall Ltd, Leeds, 10, have augmented their range of level controllers by introducing the Proxicon Mark III dust and weatherproof industrial level controller.

This new capacitance-type device is designed to control the levels of any liquids or free-flowing solids without direct contact with the material. It has no moving parts in the container, and tapped electrode terminals allow remote control for distances up to 3000 ft from the unit. A heavy-duty contactor type double-pole change-over relay with Elkonite-faced contacts improves contact life and gives increased flexibility in control circuit functions.

Improved circuitary and manufacturing techniques set a new standard in enabling sensitivities greater than 1·0 pf to be achieved, subject to variations of not more than ± 0·25 pf with main variations of + 5 per cent to − 7½ per cent and not more than ± 1 pf with temperature variation of 20 F from a 68 F datum figure.

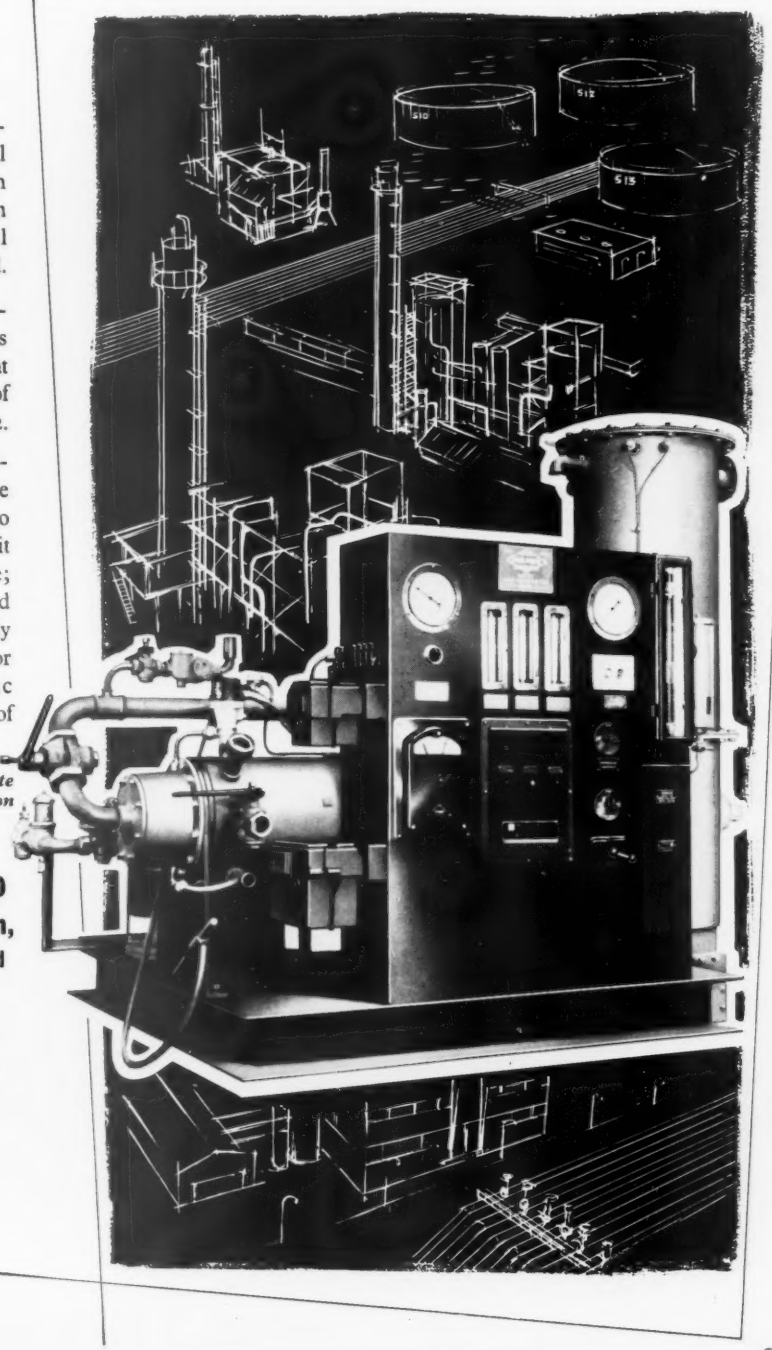
Electronics Monitor A Safe Wigner Energy Release

Full instrumentation contributed to the safety of the recent successful release of Wigner energy on the BEPO reactor at Harwell.

On BEPO a battery of 75 electronic recorders, many of which were manufactured by Honeywell-Brown Ltd, maintain continuous graphs of temperatures on all parts of the reactor. UKAEA requirements for 10 special recorders were met by Honeywell-Brown Ltd in under a month.

The release, which is periodically necessary to restore the effectiveness of the graphite moderator, was initiated by slow heating of the graphite. Heated air was drawn into the reactor through the air-inlet ducts until the temperatures reached a value at which the energy release began to take place. At this stage the crucial phase of the operation began. Rapid temperature rises occurred in the moderator, but fans were ready to blow the reactor cold if safe temperatures were exceeded.

Inert Gas for Industry



Holmes Inert Gas Generators, both gas and oil fired, are being used in increasing numbers in refineries and chemical plant throughout the world.

By the use of such a generator high quality inert gas can be produced on site at a fraction of the cost of bottled gases or of solid CO_2.

The advantages of generating inert gas in this way are obvious; it can be piped to any point on site where it will be instantly available; it can be compressed and stored; supplies are virtually unlimited and the generator being fully automatic requires a minimum of maintenance.

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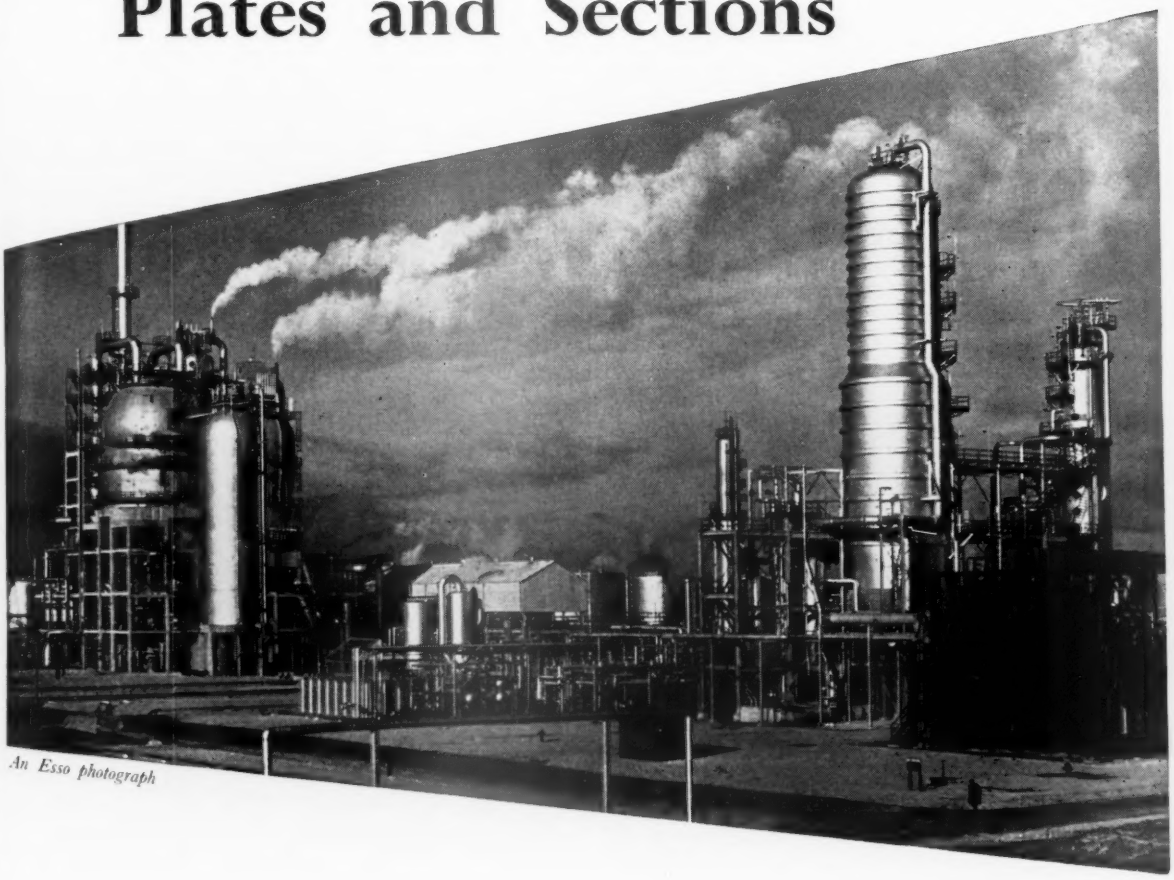

An Esso photograph

Appleby-Frodingham Steel Plates and Sections have played a great part in the construction of recent large plants for the production of petroleum and chemical products. Special 'welding quality' Appleby Plates are used in the fabrication of tanks, process equipment and pressure vessels.

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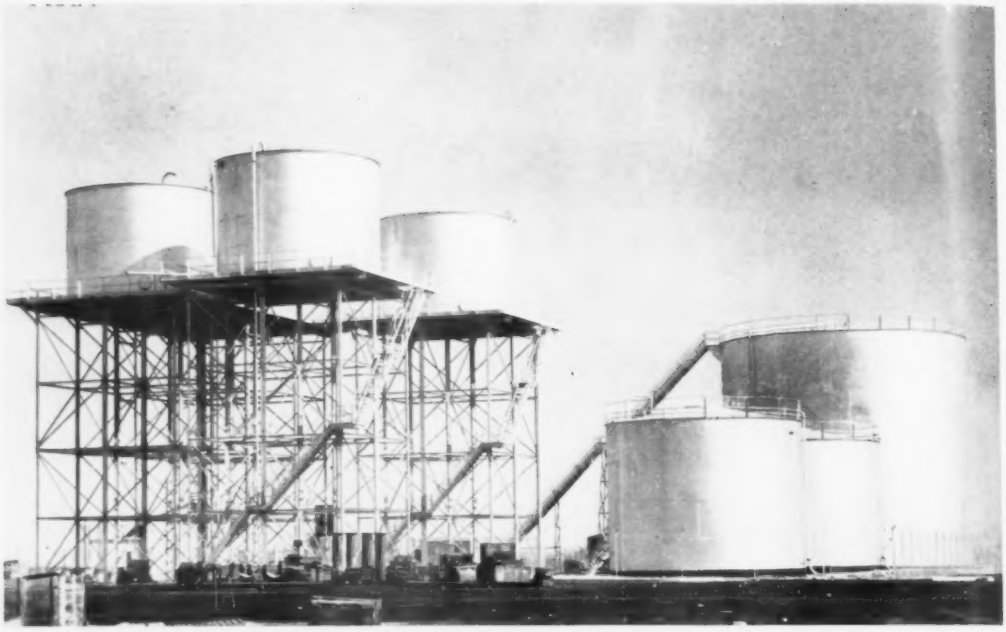

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Industry is year by year proving the value of these claims in Flues, Ash-Pits, Reactors, Cyclones, Cat Crackers, Coke Hoppers, Down Comer Pipes, Hydroformers, Water Turbine Flumes, Underground Galleries, etc.

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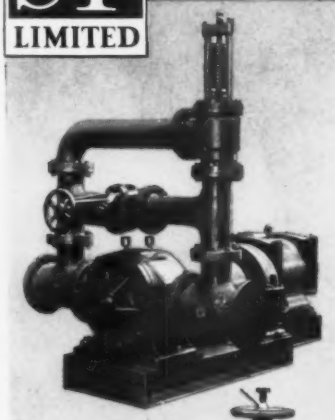
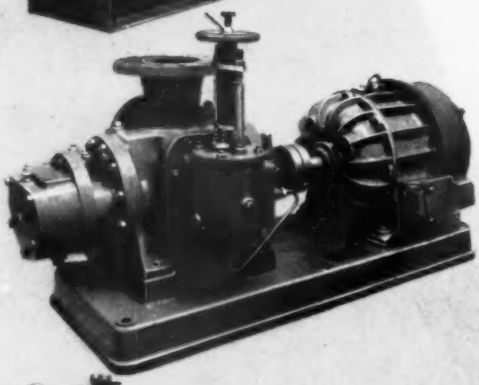
S&P LIMITED PUMPS



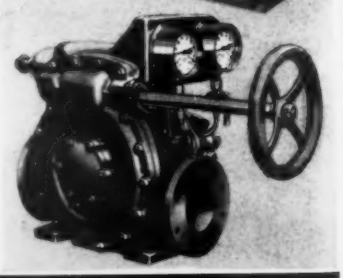
(Left) Positive Acting Rotary Displacement Pump for the handling of Molasses and viscous fluids, electrically driven through totally enclosed Reduction Gear Box.

(Below) Suitable for handling Spirits and other volatile fluids, this Screw Displacement Pump is of the all round clearance design and is capable of working with a high suction lift. The flow is practically pulseless and the unit self priming.



(Above) Positive Acting Variable Output Guinard Rotary Piston Pump. Electrically driven through Reduction Gear Box, for Oils of varying viscosity.

(Right) Reversing Flow Rotary Displacement Pump for fitting on tank wagons. These pumps are driven from a power take-off on the gear box.



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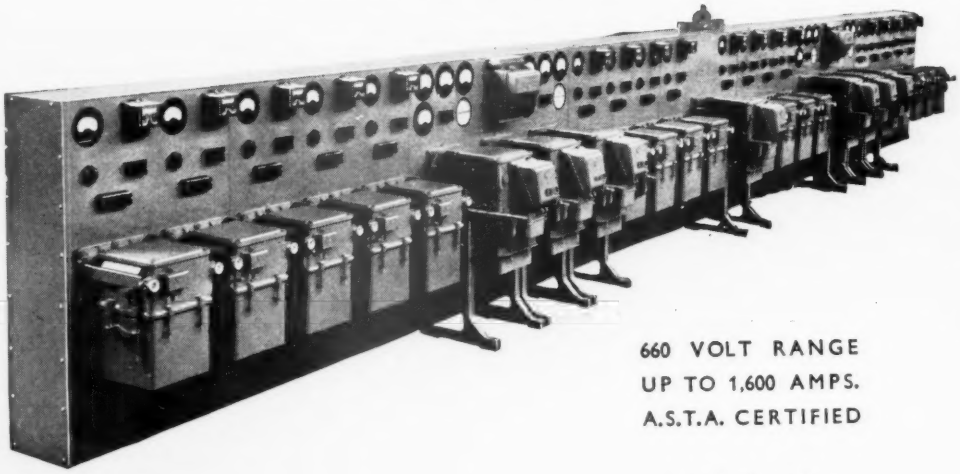

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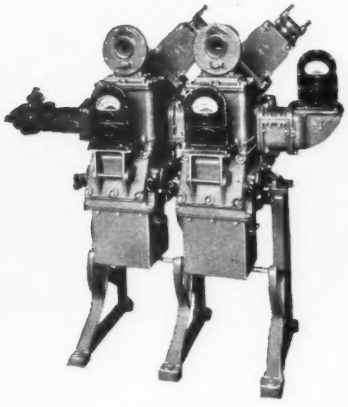

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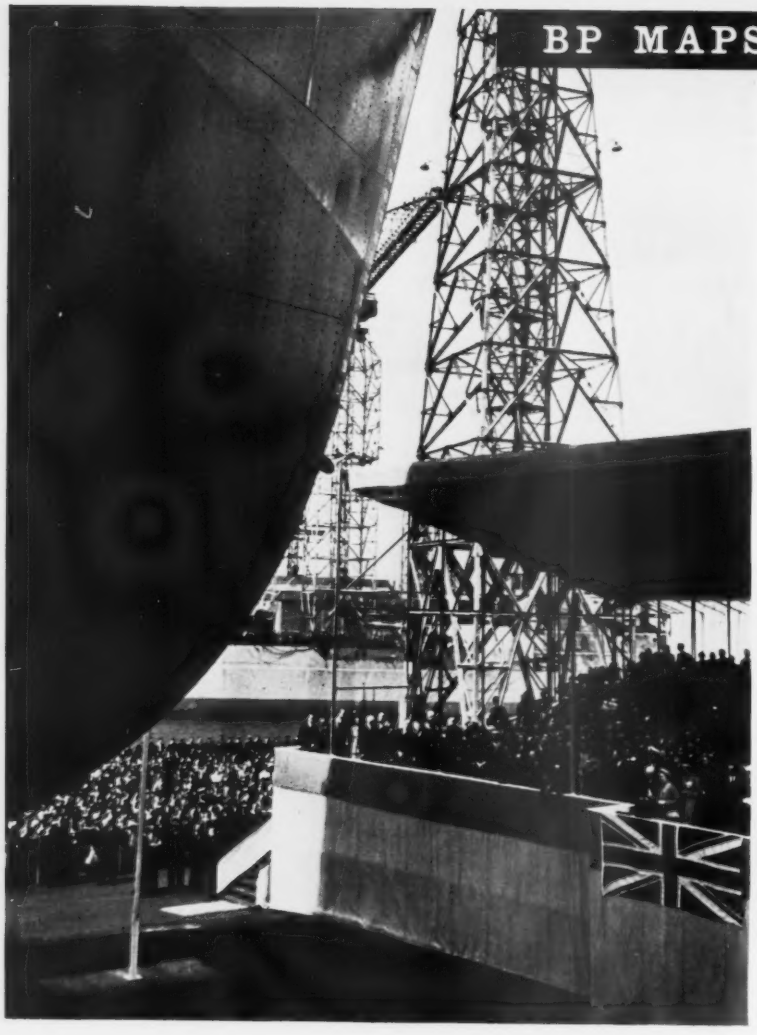
BP MAPS THE FUTURE



There she goes! *H.R.H. The Duchess of Gloucester names her 'British Duchess' and down the slipway and into the Clyde moves the first of BP's 42,000-ton tankers.*

Full steam ahead. *This funnel will be fitted to 'British Duchess' just as soon as they start work on her again; which will be only minutes after she is launched.*

Clydebank's first 42,000-ton tanker

With a roar of hawsers, and a great cheer from the hundreds thronging Clydebank, the first 42,000-ton tanker ever built by a British firm for a British fleet recently slid down the slipway. Launched by H.R.H. The Duchess of Gloucester, her name is—BRITISH DUCHESS.

BUILT by John Brown of Clydebank (they built both the Queen Mary and the Queen Elizabeth) this ship, on order to The BP Tanker Company, is the biggest tanker yet to be built in Britain to sail under the British flag.

Second only to the Queen Mary

The British Duchess is a mighty ship indeed. In fact, as Sir James McNeill, Managing Director of John Brown & Co. said at her launching, "*When she is completed, her displacement tonnage for vessels under the British flag will be second only to the Queen Mary*".

But BP plans far bigger ships than this. Others now building or on order include six 42,000-ton sister ships to the British Duchess, 12 other vessels of 50,000 tons and 7 giants of 65,000 tons.

Oil supplies doubled?

Within the next 10 years Britain may have to double her oil supplies. The British Petroleum Company is making sure that not only is the oil found and brought to the surface and refined, but that there are the ships to carry it. Ships like the British Duchess are even further proof of how confidently BP plans for the future.

THE BRITISH PETROLEUM COMPANY LIMITED

BP

New Light-weight Fire Extinguisher

A new aerosol fire extinguisher is claimed to make possible the provision of a small fire-fighting appliance beside each work-bench, machine, or office desk to deal with minor outbreaks of fire.

The extinguisher, which is known as Gwish, is claimed to be entirely new both to Britain and Europe, and costs only one-third of the price of normal fire extinguishers. It contains 12 fluid ounces of extinguishing non-electrical conducting fluid and can be held and operated in one hand. It is manufactured by Deb Chemical Proprietaries Ltd, Belper, Derbyshire.

New Valve Company Formed in France

Joshua Hindle & Sons Ltd, Leeds, 1, have formed a new company in France, which is known as Hindle-Hamer Française, SARL, and has its head office at 6 Avenue Franklin-Roosevelt, Paris, VIIIe. This Company will manufacture in France products formerly made in Leeds, and these include those made under licence from Hindle-Hamer Valves Inc., California. The range includes line blind valves, visible wedge valves, and leak-proof gate valves.

Rigid Thermoplastic Sheeting

A new tough rigid thermoplastic copolymer, FROMOPLAS N, which has been extensively used in the aircraft industry, is now available in sheet form for general enginereing purposes. It is non-inflammable and can be supplied in thicknesses from 0·020 to 1 inch.

Further details may be obtained from the manufacturers, Wallington Weston & Co. Ltd, Frome, Somerset.

New Fire Alarm and Time Signal System for Stanlow

Extensions during the past few years at Shell Refining Co. Ltd's Stanlow refinery necessitated a new fire alarm system. It was decided, after experiments, to install three Secomak CS 12 coded syrens at selected vantage points.

These syrens are manufactured by Service Electric Co. Ltd, Stanmore, Middlesex, and produce several different and distinct signals. Consequently, although the syrens are in daily use for indicating times of starting and stopping work, there is no possibility of confusion with the signals used for warning of fire.

Factory Expansion of Gresham Transformers Ltd

To free their main factory for the manufacture of distribution and industrial transformers, Gresham Transformers Ltd have recently erected a new heavy transformer assembly bay at their Twickenham works.

The new bay is a clear-span brick-clad steel-framed single-storey structure which incorporates electric space heating by elements embedded in the two-layer concrete floor.

Test equipment is provided for testing and recording at up to 1 million volts by an impulse generator and oscillograph. The new bay will permit production of transformers of sizes up to 10 MVA.

Fire-extinguishing Equipment Catalogue

Oil tanks silhouetted against a burnt-out roofless building under a sombre red sky form the impressive cover of *Fire Protection*, a catalogue of the fire-extinguishing sprinklers and other equipment manufactured by the Matthew Hall group.

Among the numerous illustrations that comprise the greater part of the book is a sequence of five photographs showing how a 15,000-gal tank of burning oil was extinguished in 4 sec.

Copies of the catalogue can be obtained from Matthew Hall & Co. Ltd, Dorset Square, London, N.W.1.

New Safety Lock-up Valve

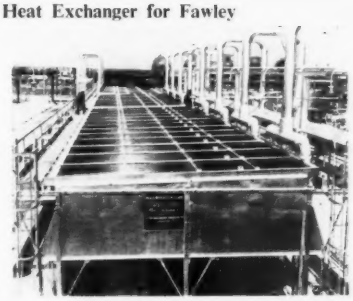
A new safety lock-up valve has been introduced by Crosby Valve and Engineering Co. Ltd, Ealing Road, Wembley. This brass valve is connected in the air-line between the control instrument and the diaphragm connexion of the control valve. It automatically, on failure of the air supply, locks into its last position. Its rating is in the range 10–40 psi.

Taylor Instrument Companies Expansion

A new associate company of the Taylor Instrument Companies, whose main office is in Rochester, N.Y., U.S.A., has been opened at Bockenheimer Anlage 38, Frankfurt-am-Main, Germany, under the title of Taylor Instrument G.m.b.H.

The new company at present is dealing with sales, service, and maintenance in the area but actual manufacture of Taylor instruments in Germany is later envisaged.

Mammoth Heat Exchanger for Fawley



Designed and manufactured by Head Wrightson Processes Ltd for use at Esso's Fawley refinery is the mammoth air-cooled heat exchanger, shown in this illustration, which is claimed to be the largest installation of its type in Britain. It is designed to cool steam and hydrocarbon vapour with a heat load of 173×10^6 Btu/hour at a dry bulb temperature of 90° F.

Perkins Engines for Midget Submarines

Britain's midget submarines, known as X craft, use Perkins six-cylinder P6 diesel engines to provide electrical and propulsive power. For surface operation the submarines run direct on the diesels, but under water the submarine is driven by batteries charged from these engines.

New Sludge-preventing and removing Fuel Oil Additive

E. I. Du Pont de Nemours & Co., Delaware, U.S.A., have introduced a new sludge-preventing and removing fuel oil additive, the Du Pont Fuel Oil Additive No. 2. In one test the additive eliminated a 6-inch deposit of sludge in a 50,000-gal residual fuel oil tank in a single week.

Industrial and Research Chemicals List

Jenson, Lawson & Co. Ltd, 34 South Molton Street, London, W.1, have issued a list of the range of industrial and research chemicals they have available.

The Company, which specializes in coal tar products, has increased its range to include chlorinated and alkylated phenols, etc.

Matthew Hall Contracts

The design, procurement, and construction of a number of new chemical plants were among projects undertaken by the Chemical, Oil Refinery, and Industrial Engineering Divisions of Matthew Hall & Co. Ltd during 1957. This information is given in the chairman's statement at the annual general meeting, which also mentions that Matthew Hall (Pty) Ltd, South Africa, secured contracts for plants for desalting mine water, oil blending, and insecticides.

Oily-water Separator Passes Ministry Test

The oily-water separator produced by Carruthers Ltd of Glasgow has passed the Ministry of Transport and Civil Aviation test and is suitable for ships affected by the Oil in Navigable Waters Act, which came into force on 1 July.

This separator is the only one so far to have passed the Ministry test at the first attempt. The Company is now experimenting with adaptations for fully automatic working.

Standard Nitrogen Generators

The Holmes-Kemp nitrogen generator, produced by W. C. Holmes & Co. Ltd, Turnbridge, Huddersfield, can produce nitrogen by combustion of any commercial fuel gases with air. Operation can be almost entirely automatic and the gas produced is claimed to have a purity that compares favourably with that of nitrogen made by any other full-scale production unit. Plant to produce up to 20,000 cu. ft/hour of nitrogen are available.

World-wide Geophysical Prospecting

Some indication of the world-wide achievements of the Geophysical Prospecting Co. Ltd in the search for minerals and metals is given in a recent brochure issued by the Company. Surveys were conducted in India, Africa, North and South America, the Persian Gulf, and European countries and each area is illustrated by a map which gives the object of the survey.

The British Company, with head office at 20 Albert Embankment, London, S.E.11, forms part of the Geoprosco Group which is composed of nine companies registered in London, Toronto, Calgary, Casablanca, Paris, and Madrid.

Catalogue of Organic Chemicals

L. Light & Co. Ltd, Poyle Estate, Colnbrook, Bucks, have recently issued the 1958 edition of their catalogue of organic chemicals, and copies are available free to interested enquirers.

The Company also holds stocks of silica gel 100–200 mesh, manufactured by the Davison Co., U.S.A., which is used to ensure minimum olefin polymerization, and the fluorescent indicator, both of which are specified in ASTM D. 1319–54T and IP 156/56T.

Rotary Shaft Seals for Cologne Refinery

Flexibox mechanical seals have been exclusively adopted for all pumps requiring positive gland sealing at the new Esso refinery under construction at Cologne. More than 100 Flexibox-fitted pumps will handle a wide range of fluids, including hydrocarbon liquids and gases, alkalis, light and heavy fuel oils, and organic chemical solutions. Temperatures up to 240 C (464 F) and pressures as high as 27 atmospheres will be encountered.

Three-stage Compressors

The new three-stage straight-line compressors introduced by the Consolidated Pneumatic Tool Company of 232 Dawes Road, London, S.W.6, are designed for the continuous compression of air or other gases to pressures of up to 1500 psi with a free air delivery of 242 cfm at that pressure. For operating periods of not more than eight hours, the compressors may be run to give 238 cfm at 2000 psi.

Refractory Castables

A two-colour leaflet, published by Super Duty Refractories Ltd, 37–45 Creechurch Lane, London, E.C.3, defines refractory castables as a special grade of refractory concrete, in which high-temperature refractory aggregates replace the normal sand and gravel and the binder is a high alumina calcium aluminate hydraulic cement.

SITUATIONS VACANT

British Petroleum Company Ltd has vacancy for a **Bitumen Technologist** at its Head Office in London. Applicants aged 30–40 must have degree in Chemistry or Engineering or A.M.I.C.E. Experience in the use of bitumen is essential and some knowledge of waxes and protective coatings desirable. Duties will be concerned primarily with technical aspects of the application of bitumen in road making and in industry. Salary according to age, qualifications and experience, non-contributory Pension Fund, assisted House Purchase Scheme. Removal expenses and settling-in allowance payable in certain cases. Luncheon club. Write giving full particulars, quoting reference H.4510, to Box 5813 c/o 191, Gresham House, E.C. 2.

BEARING SPECIALIST required by the Owen Organization to develop sales of recently established bearing alloy. Initially based in Bristol to cover South West England and South Wales. Enthusiasm and energy required with good opportunities for advancement to Sales Manager leading team similar to the first appointment. Primary requirements are a sound engineering knowledge of bearings of all types other than ball and roller, together with ability to deal with problems in the field.

Age group suggested is under 40. Remuneration according to ability and experience but above £1000 per annum plus commission and expenses. A superannuation scheme is in existence. Apply giving full particulars to the director and general manager, C. & L. Hill Ltd, Stringes Lane, Willenhall, Staffs.

FOR SALE

For sale—five new 10,000-barrel capacity bolted bulk storage tanks by Columbian Steel Tank Co. 55 ft dia. × 24 ft high, suitable for all petroleum products. In original sea-worthy packing. Reed Bros (Engineering) Ltd, Replant Works, Woolwich Industrial Estate, Woolwich, S.E.18.

Forthcoming Meetings

THE INSTITUTE

(At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.

Harmful Effects of Electrostatic Charges on Machinery and Lubricating Oils. Dr T. Salomon. **17 September**

(At 61 New Cavendish Street, London, W.1, 5 p.m.—tea 4.30 p.m.)

Fuels and Lubricants for Commonwealth Trans-Antarctic Expedition. D. L. Pratt, M.A., Grad.I.Mech.E., G. M. Christie, M.I.Mar.E., E. F. Coxon, A.M.I.Mech.E., F. Inst. Pet., and J. R. Lodwick, B.Sc., A.R.I.C., A.F.Inst. Pet. **1 October**

(Meeting at 5.30 p.m.—tea 5.0 p.m.)

Mechanism of Blocking in Waxes. Dr D. M. Macleod. **22 October**

IP ECONOMICS AND OPERATIONS GROUP

(At 61 New Cavendish Street, London, W.1, 5.30 p.m.—tea 5 p.m.)

Economics and Forecasting in Road Transport. E. H. J. Dixon. **9 October**

IP FAWLEY BRANCH

(At Esso (Fawley) Recreation Club, Holbury, at 7.30 p.m.)

Joint Meeting with Royal Institute of Chemistry, Southern Counties *Branch*

Antibiotics Manufacture. B. Emery, B.Sc., F.R.I.C. **15 October**

IP LONDON BRANCH

(At 61 New Cavendish Street, London, W.1, 6 p.m.—tea 5.30 p.m.)

Soviet Earth Satellites. O. K. Sapounov. **22 September**

IP NORTHERN BRANCH

(At Engineers' Club, Albert Square, Manchester 2 at 6.30 p.m.)

Some Aspects of the Lubrication of Nuclear Power Equipment. Dr Irving. **21 October**

IP SCOTTISH BRANCH

(At North British Station Hotel, Edinburgh, at 7.30 p.m.)

Trans-Antarctic Expedition. J. G. D. Pratt. **16 October**

IP SOUTH WALES BRANCH

(At Training Centre, BP Refinery (Llandarcy) Ltd, 5.30 p.m.)

Presidential Address. C. M. Vignoles, C.B.E. **9 October**

IP STANLOW BRANCH

(At Grosvenor Hotel, Morecambe, at 8.30 p.m.)

Joint Meeting with the Royal Institute of Chemistry.

Gas Chromatography. D. H. Desty. **26 September**

(At Lecture Theatre, Grosvenor Museum, Chester, at 7.30 p.m.)

Joint Meeting with the Royal Institute of Chemistry.

Technical Education with Specific Reference to the Needs of the Petroleum and Petroleum Chemical Industries. E. Le Q Herbert, B.Sc., F.H-W.C., F.R.I.C., M.I.Chem.E., M.Inst.Fuel, F.Inst. Pet. **15 October**

OTHER SOCIETIES

ROYAL INSTITUTE OF CHEMISTRY

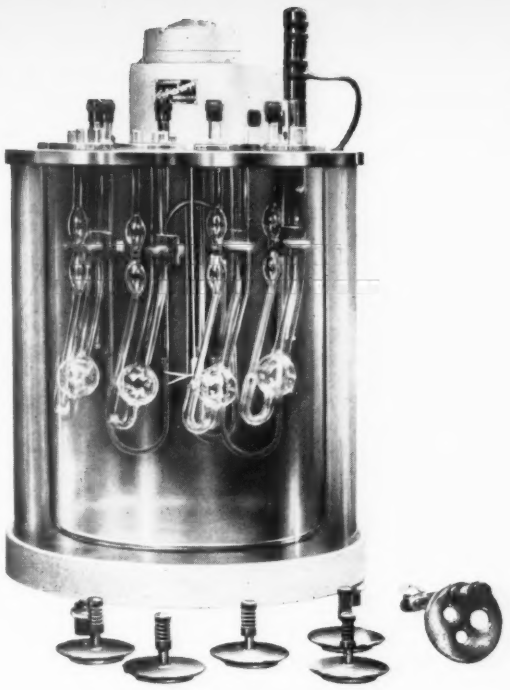
(At Nicholson Theatre, University Liverpool at 7.0 p.m.)

Some Petroleum Specialities: Insulating and White Oils. V. Biske, B.Sc., LL.M., F.R.I.C., F.Inst.Pet. **9 October**

GALLENKAMP VISCOMETER BATHS

for kinematic viscosity determinations

Suitable for methods described in IP 71, BS 188 and ASTM D445



Two types are available, one being a single-walled glass vessel for a nominal maximum temperature of 100° F but capable of successful operation at 140° F. The other is double-walled, comprising one glass vessel inside another and designed for a maximum temperature of 210° F. This model can be used at lower temperatures, if required. Both can be fitted with a cooling coil for circulating a cooling liquid when the ambient temperature rises above the required setting. Five viscometers can be accommodated. Accuracy of control is within ± 0·025° F. at all temperatures and approaches 0·01° F at 100° F.

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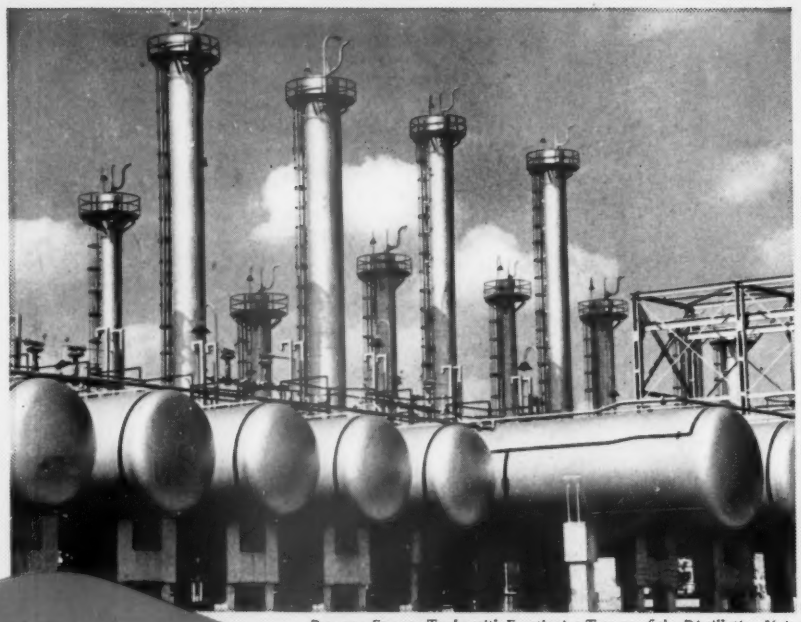

Pressure Storage Tanks with Fractioning Towers of the Distillation Unit at the new Shell Chemical Plant, Stanlow near Chester, Eng. (A Shell Photograph)

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The new S & J ST-9749 diaphragm type breather valves now manufactured by Whessoe are a major achievement in storage tank venting and vapour conservation. Increased flow rates have been achieved and their resistance to sticking, corrosion and freezing are unequalled. Great reduction in weight has been achieved by building in aluminium and stainless steel. These valves are already available in the 4″, 6″ and 8″ sizes. Please write for further details.

S & J Tank Fittings are manufactured by Whessoe under licence from Shand & Jurs Company, Berkeley, California, U.S.A.

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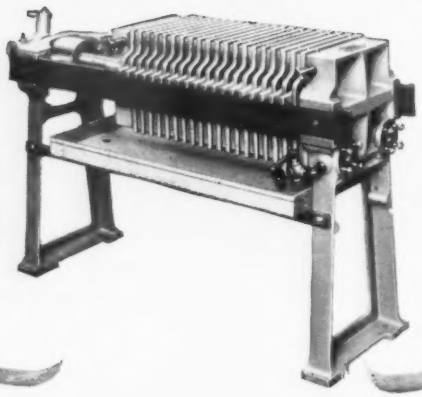
FILTER PRESSES



The illustration shows a cast iron 13 in. square "V" type filter press which is mainly used with filter cloths and filter papers as a polishing filter for oils, etc. Filter presses are also made in stainless steel, aluminium, gunmetal and timber in a variety of designs and are provided with suitable pumping machinery.

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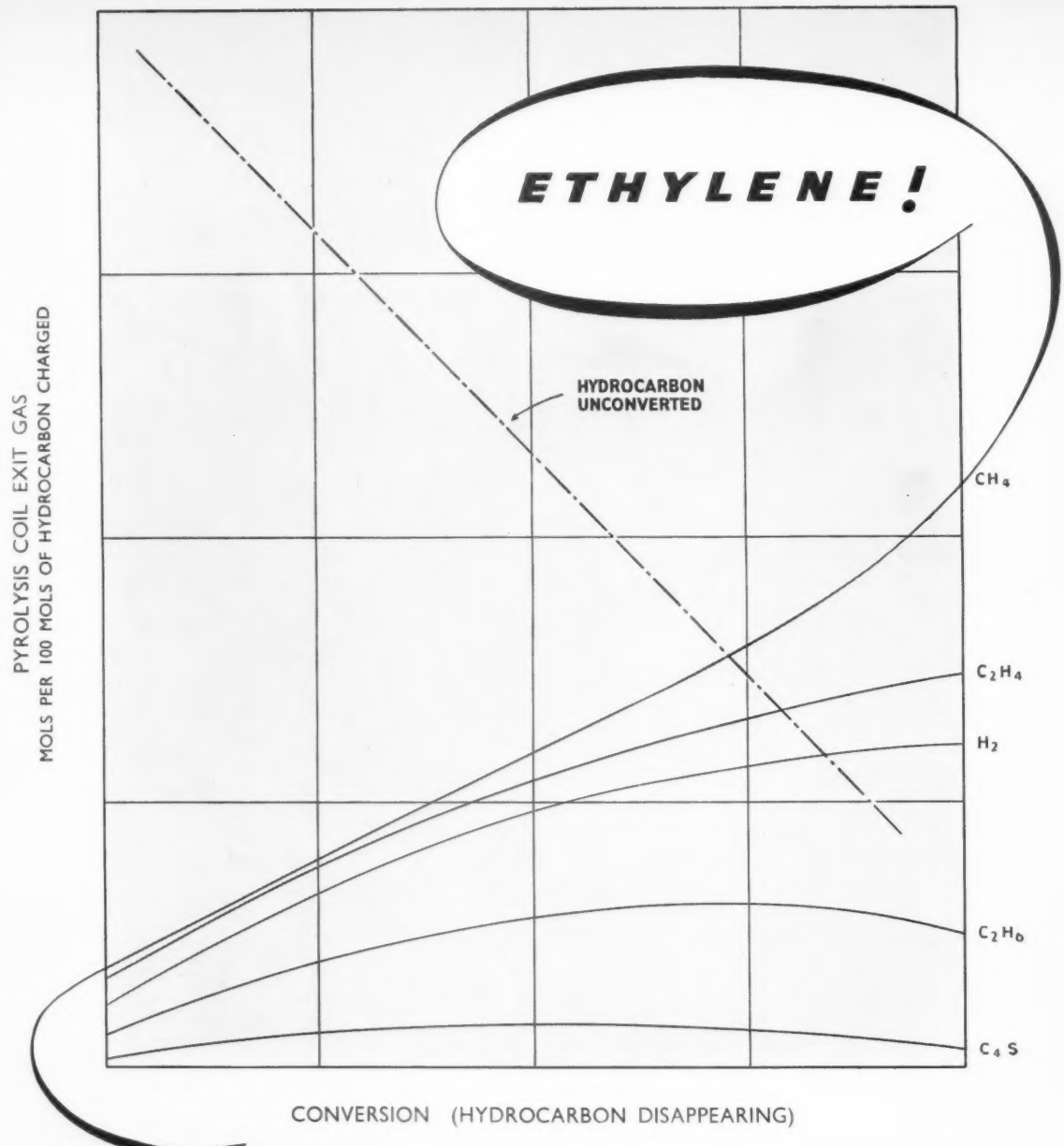

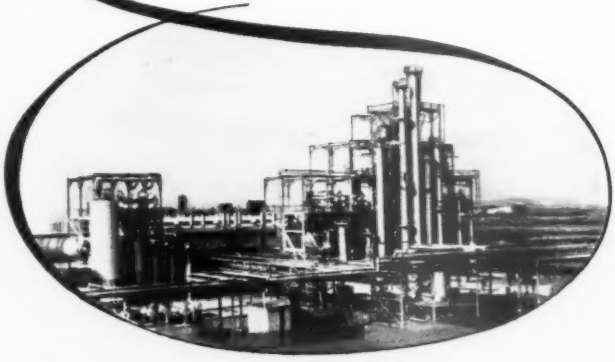

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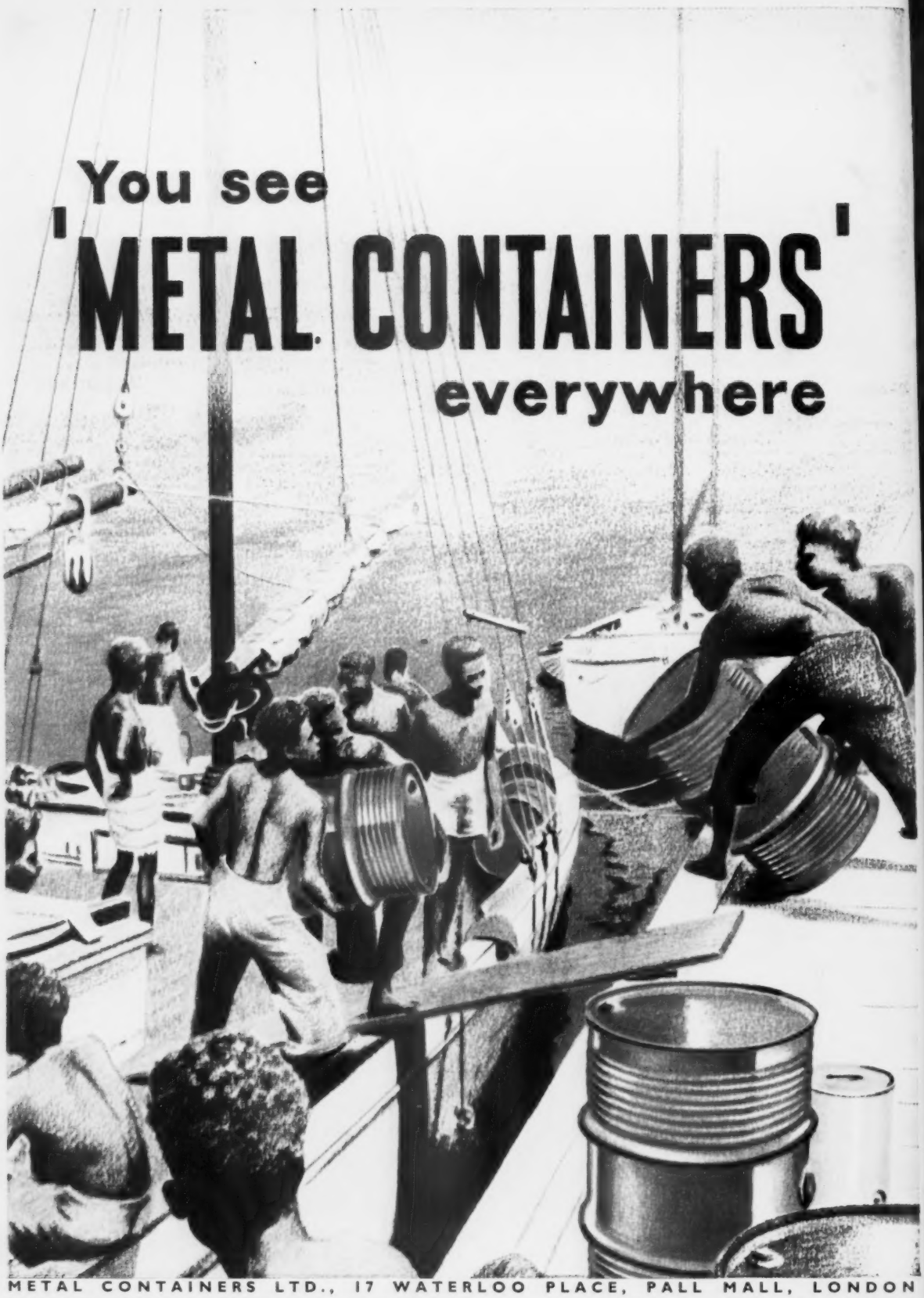

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